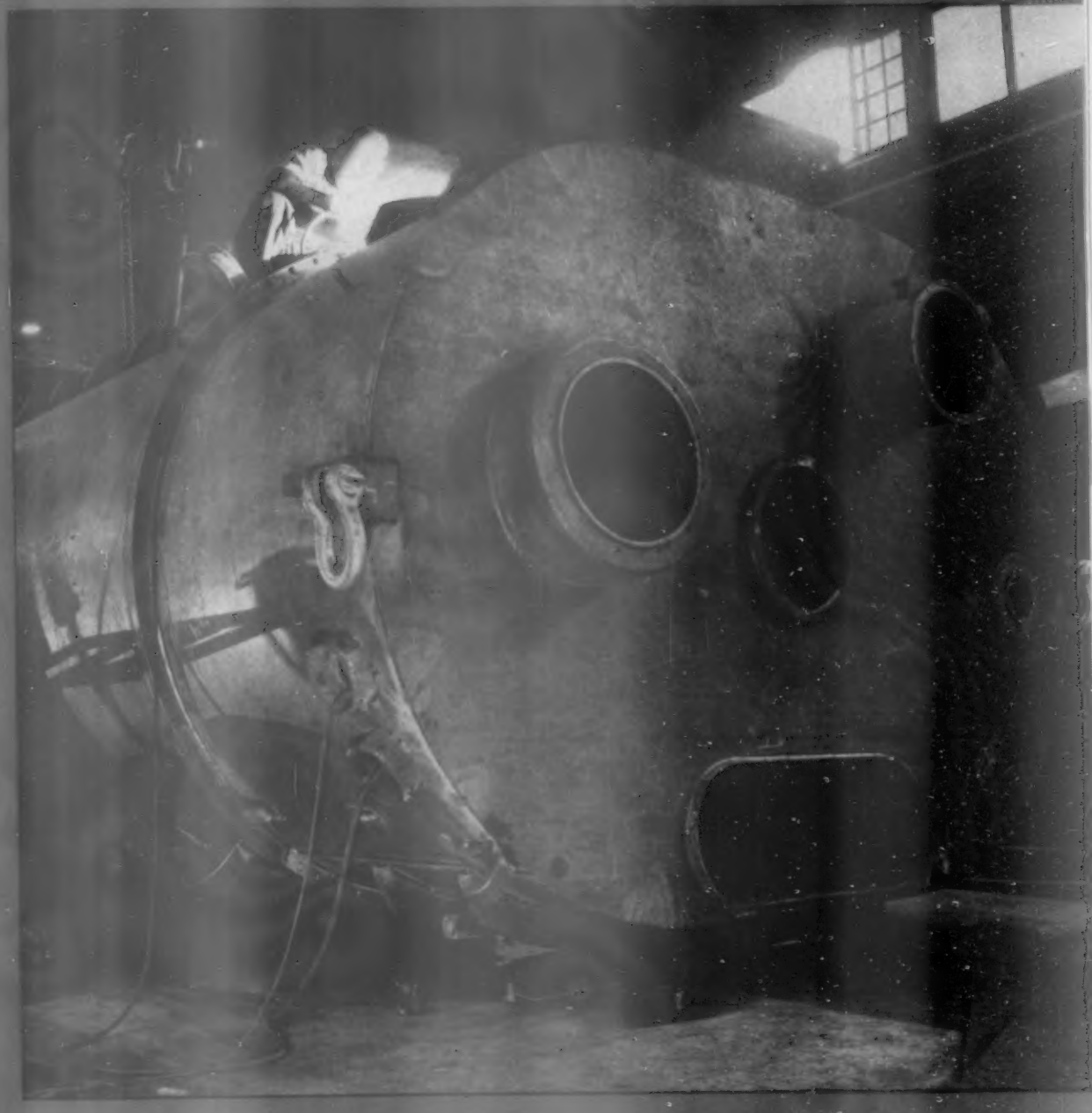
Welding Engineer

NEER BUSINESS AND TECHNICAL JOURNAL OF THE WELDING INDUSTRY



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Welding flange of a 40,000 KVA transformer tank which is being built in the shops of the Allis-Chalmers Mfg. Co. for the U. S. War Department Bonneville Dam. (Photo, Allis-Chalmers Mfg. Co.)

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The Selection and Application of Welding Rods*

Vertical welding with a reverse polarity electrode. (Photo Templeton Kenly & Co.)

★ While welding electrodes are used extensively, very little is generally known about them. There is a reason however why each of the different types is best suited for a specific job.

When one begins to discuss filler materials used in the various welding processes he is quick to learn the importance of the numerical figure two. First of all, there are two types of welding rods — the gas and the electric. Correctly speaking, the wires used in electric welding are called electrodes, however, since most of us know them as electric welding rods, that is how they will be referred to in this discussion. We will leave the gas rods for some of the oxygen and acetylene men to discuss confining this paper to the electric. In this field, there are two types—bare and coated. Inasmuch as the bare rod has practically been eliminated from the field, we will further limit the discussion to the coated type. Here again there are two types in the field — the mild steel and the alloy.

In the mild steel class there are two types of rod, the straight polarity and the reverse polarity.

Straight Polarity

First, we will take up the straight polarity, because in this class will fall the greater part of the work in this territory due to the fact that this type of rod is used on both DC and AC machines. Also, in this class falls the so-called down hand and fillet rods which we will try to place later.

Before we go too far, let's determine what is meant by straight polarity and the effect it has on the welding rod. In order to set your machine for straight polarity the positive side of the machine is grounded — the negative side then becomes the welding rod. As we all know, the positive side of the electric current is the hot side, whether it be electric welding, a light bulb, or the battery in your car. That being the case then, the metal as it is being deposited using straight polarity leaves the point of the rod in a thick jelly or goblet consistency, which permits the operator to push it around or place it wherever he desires. Now with the majority of our job

*Abstracted from a paper presented by E. E. Clark, Engineer, Harnischfeger Corp. at the 13th Annual Iowa State College Welding Conference, Ames, Iowa.

Hard-facing and alloy rods are usually reverse polarity.

shop welding being poor fit-up jobs, we must bridge wide gaps where it would be impossible to use other type rods, so the straight polarity rod is used. It is generally universally accepted that with a straight polarity setting 60% of the heat is generated on the work and 40% on the rod with the DC machine. On the AC machine the heat division is 50/50. So the working condition is very similar on both types of machines. Of course this type of rod can be used in all positions, that is: down hand, vertical and overhead. But as was stated before, certain welding wires are made specifically for down hand and fillet welding which generally fall in the straight polarity group, and as the names imply, they cannot be used for all position welding. Any number of times, operators have been found trying to make vertical and overhead welds with the down hand type of rod. Naturally they were cussing the rod because the flux ran down, the metal sagged too much or for a number of other reasons that the manufacturers had not tried to control, as the rod had been coated for a specific purpose and that was down hand work.

Reverse Polarity

As to the reverse rod; with straight polarity, the positive side is grounded, so with reverse polarity the negative side must be grounded. This leaves the hot side open, delivering 60% of the heat on the rod so the burned down rate of the rod is much faster than with the straight rod. Reverse rods are sometimes referred to as a speed rod for this reason. Since the greater portion of the heat is on the rod, the metal is deposited in more of a spray, or liquid condition. Consequently, this type of rod cannot be used on poor fit-up work and a gap cannot be bridged as well as with straight polarity rod. On factory work, tank work, and where the fit-up will run uniform, the reverse rod gives much better results. This type rod also gives better results on overhead welding, due to the fact that the metal being deposited is broken up in more of a spray, a short arc can be carried without short circuiting the rod, causing it to stick. The hot metal of the rod is being deposited against the cooler metal of the work chills more quickly, thereby eliminating the hang-downs that give so much trouble when using the straight polarity rod overhead. Now, don't tell me that all overhead work is good fit-up; I know that they are not but you certainly can run stringer beads on either side of the work until the gap is brought together so you can weave a bead across it. This type of rod will not work satisfactory on A.C. machines, so if at any time you should receive a rod of this type by mistake — don't cuss the rod, because it will not work on your transformer machine, just send it back to your jobber and he will be glad to exchange it for a straight rod that will work satisfactorily. If the rod sputters or splatters and it is hard to hold an arc on an A.C. machine, then, no doubt, you have the reverse rod. The reverse rod is also used very satisfactorily on D.C. machines for arc cutting of metal by using it on straight polarity.

In the reverse type of rod falls most all of the alloy rods. The alloy rods are also two types, one having all of the alloying elements in the wire itself—the other, having some of the alloying elements in the coating. Personally, I prefer the first type because I do not believe it is possible to secure uniform deposited metal in the vertical or overhead position when the alloying chemicals are in the coating —but, before we go into the Alloy Rods, let's take up or finish some of these questions that are asked a rod salesman when he comes into your shop.

Variable Qualities

There are just two questions that I know of that really get me when I stop in to discuss rods in your shop. The first question asked by most of you boys when a new or different rod is being presented to you is: "What is the tensile strength of your rod?" I find by looking into the records that the tensile strength of our straight polarity rod is 70,000 to 80,000 lbs. with a ductility or reduction in area of 20 to 25% in two inches. This is true of most straight polarity rods, regardless of the manufacturer. In this respect they differ very little but in regard to the way the rod operates, which is controlled entirely by the coating, you will find a great difference.

Now, I will say that all mild steel rods and also alloy rods fall in two classes—good ones and better ones, but it makes no difference in what class the rod falls, or what the tensile strength of the rod is, as it comes out of the container, you are going to crucify it anyway. Now, let's see why: First, you are in too big a hurry to get the "two bits" that you are going to receive for the job into your pocket. As a result you use about twice as much heat on the rod as you should. down goes the tensile strength, and up goes the ductility, everything all out of balance as to what the manufacturer claimed for them. Or else up goes the whole job. All because you had so much heat on the rod that it burned the chemicals out of the coating so that the carbon and other properties of the rod were attacked by the oxygen and nitrogen of the air and all you have for a so-called weld is a bead of iron oxide, or ash. On the other hand, you may do just the opposite.

When you are doing the job by the hour and want to make the job last as long as possible, you use as little heat as possible and under these conditions, the tensile of the weld can be as high as 90,000 lbs. but the ductility will fall as low as 10 or 12%. Consequently, under either of these conditions, you are not securing what you want, what the customer wants, or what the manufacturer wants in regard to tensile strength and ductility.

The tensile strength of plate or structural steel is between 58,000 lbs. and 62,000 lbs. The ductility between 14% and 16%. So, let's try to balance the heat somewhere between the two extremes and both the rod manufacturer and the customer as well as yourself will be more than pleased with the results obtained.

The other question which irritates is: "Why don't your company or someone, put out a chart that will tell us how much heat to use on a certain size rod?" Let's be reasonable, how can that possibly be done when we don't know how thick the plate is—how wide the gap is—in what position the work is being done—how hot or cold the weather is—how hard the wind is blowing—or how many drinks you had the night before, all of which change the required amount of heat.

Alloy Materials

Alloy Rods as stated before, usually fall in the reverse class. First, we will take up the hard-facing rod. If they were to run on the straight polarity side with the work hot and rod cold, we would get too much dilution from the parent metal and their hardening effect would fall probably as much as 20 point Rockwell below factory specifications. We would also get a much rougher surface because straight polarity builds up whereas reverse polarity spreads out or lays flat. Now, I know some of you are going to ask, or are asking yourselves, if we have a hard-facing rod for electric machines to hard-face plow shares? No! We are perfectly willing to leave that to the acetylene boys but on dragline dipper teeth, hammer mills, crusher jaws and all such type of work, we have really got it.

Next, is the stainless steel rod—this rod is made in four types: 18-8, 18-8CB, 25-12 and 25-20. In the first two, the greatest difference is that the columbium has been added to the CB rod. This makes the rod flow easier, adding slightly to the strength and helps to eliminate the discoloration at the point of fusion on the sides of the weld, so if the work must be finished perfectly, it can be done without the so-called rust streak showing.

The 25-12 rod is of higher nickel and chrome content and is an ideal rod for bonding on all manganese steels, as both chrome and nickel are the affinities of any of the metals. It will make a perfect bond where other rods fail.

The 25-20 rod has a very high tensile strength, running as high as 100,000 lbs. with a ductility test of 40% to 45%. These rods, of course, all fall in the austenitic high tensile or ductile class. So, a good rule to follow is when you can't do the job with any other rod, use stainless steel.

The next type is an alloy rod for welding the high tensile low alloy steels such as Yoloy, Cor-Ten, Republic Double Strength and other steels that contain copper and nickel. These types of steel are fast coming into use where the high tensile strength lighter weight steels are desired together with corrosion resisting properties much higher than those of plain mild steels. Some of the uses of this steel are the ribs and under-structures of truck and trailer bodies, tanks, both underground and those that must carry liquid that contains acids. I saw a tank in an oil field months ago, where the nipple had been welded in with a mild steel rod, and the acid in the crude oils had eaten the weld out in two months. This was welded back with a tungsten molybdenum alloy rod some six months ago and it is still holding perfectly. This not only proves that a chain is no stronger than its weakest link and a weld is no better than a rod used, so if we pick the wrong rod we will have plenty of trouble, so let's be careful.

Conclusions

In summing up this presentation remember we use the straight polarity rod on all general repair work on both D.C. and A.C. current —never trying to use a reverse rod on the A.C. On the straight side of your D.C. welder use a reverse rod for cutting only. For your overhead, vertical and downhand work, where fit-up and speed permits, where high ductile with medium tensile welds are required, use the reverse. Also all alloy rods are used as reverse rods.

THE END

Positioned pipe welding is done down hand with a straight polarity electrode.

★DESIGN

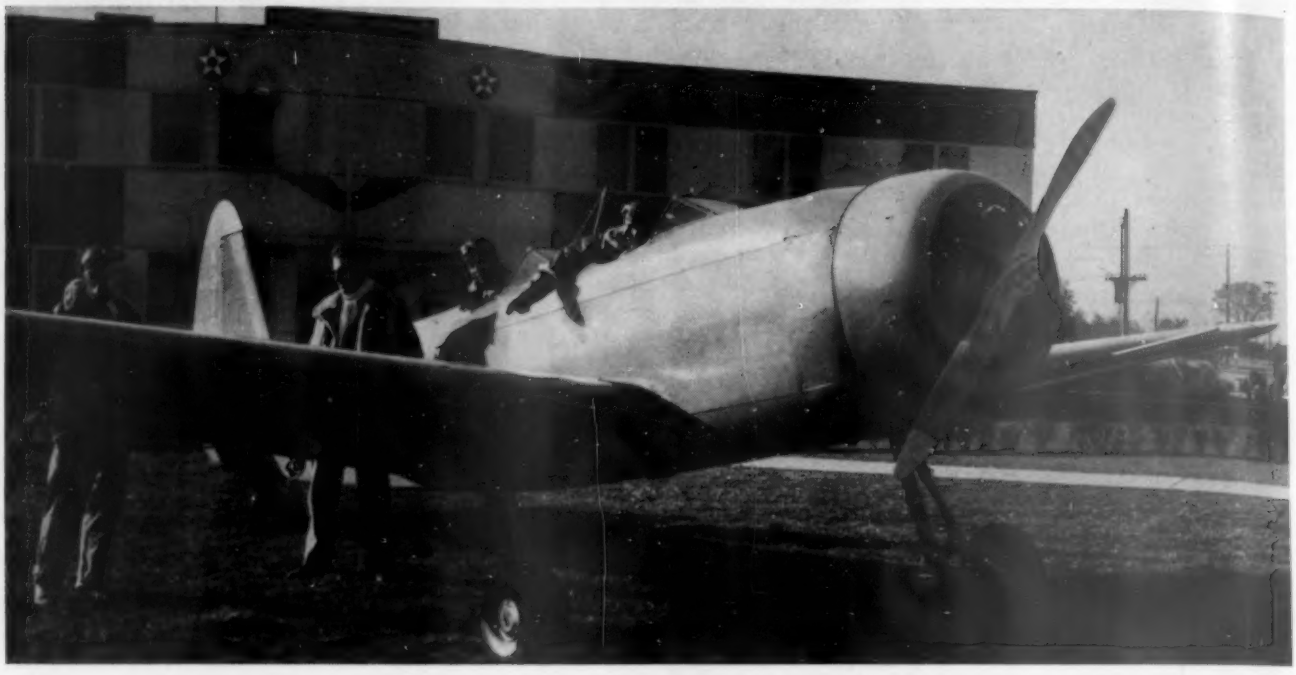


Fig. 1—A Modern Low-wing Training Plane.

Modern Jigs for Aircraft Welding

By T. B. Jefferson

Editor, The Welding Engineer

★ Jigs serve primarily to keep pieces of an assembly in alignment during construction. Jigs can also serve to slow production. On aircraft fuselage production, simple changes in design resulted in a 1100 per cent saving in time required for a specific operation.

In keeping with the increased demands for modern aircraft production, for military and training purposes, are the demands for modern production facilities. When welding was adopted as a means of fabricating airplane parts it was soon learned that welded parts to be interchangeable and readily assembled must be properly aligned. So, to expedite the building of welded tubular steel fuselages and other parts, and to insure that each part is properly aligned, aircraft manufacturers began using jigs and fixtures to hold these parts during welding.

Jig Design

The design of jigs requires ingenuity and a knowledge of the laws of expansion and contraction of metal. When steel is heated to a welding temperature it has very little strength and ductility. For this reason a crack is very easily started by any stress due to warpage or contraction. In using a jig the several parts required for a welded assembly are cut to length and fitted so that there is only a small clearance between the abutting members. This clearance should be as uniform as possible, for example, when at truss member is welded into the sidewall of a tube, the end of the member should be milled to fit the contour of the tube.

The earlier aircraft makers used jigs constructed of wood. These jigs of wooden construction, however, presented many difficulties; foremost among the disadvantages attendant the use of the wooden jig was its short life. Since it was inherently weak structurally, it was soon warped out of shape or damaged, making it unsuited for further use because of inaccuracies. Likewise, it was not infrequent that these simple wooden jigs caught on fire during the welding operation, an accidental occurrence which often shortens their effective life.

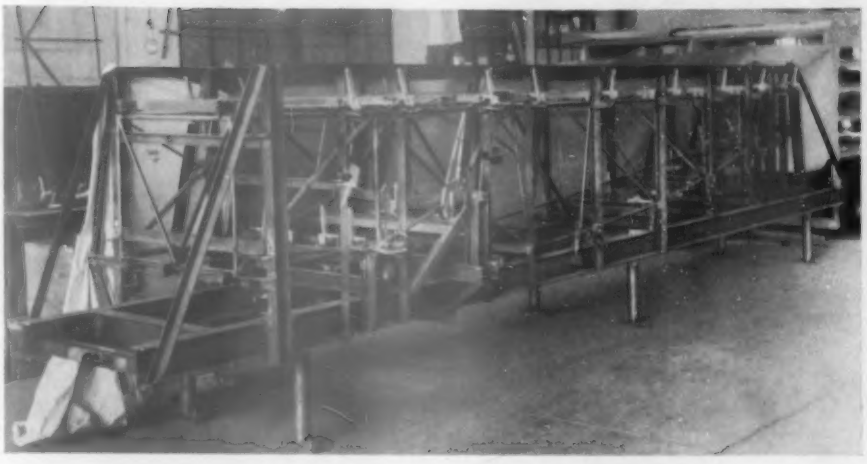


Fig. 2—The modern fuselage jig with its structural members and quick-acting toggle clamps.

Faults of Early Jigs

Such mishaps were not only disheartening but costly for it was necessary to build new jigs so that production might be continued. The building of a new jig is a difficult task, too. All parts of the jig must be laid out accurately so that, without question, the new jig is an exact duplicate of the old jig so as to insure the interchangibility of parts though made on different jigs.

Production Problems

As production was stepped up, the principal concern centered on fuselage jigs. It was found practical to build jigs of a more permanent character. It was determined that these jigs should be built of steel shapes so that they would be of reasonably heavy, rigid construction. Experience had also shown that there were three basic design principles which should be incorporated in every jig. Firstly, the jigs should be constructed so as to prevent the edges of the metals to be joined from becoming unduly chilled; secondly, provisions should be made for keeping the body of the metal cool during welding wherever there is the possibility of warpage taking place, and lastly, but not least, the jig should provide for the exact positioning of the tubular member and for clamping them in place until they are tack welded. This heavier type of jig made it possible to build hundreds of fuselages with the secure feeling that each new piece would be an exact duplicate of its predecessor. The only precaution necessary during the entire operation of welding the structure in the jig was to see that the same procedure and welding sequence was used each time.

Increased Strength for Jigs

This heavier steel jig was ideal for aircraft manufacture; as the size of the planes and their tubular members increased the size of the structural members of the jig were increased to meet the additional strength requirements.

It was not until our aircraft factories were called upon to further increase production to meet defense demands that these manufacturers recognized that the heavy structural jigs were not the ultimate in jig design. These jigs were fine from the standpoint of holding the plane parts in alignment but too much time was required to place the parts in the jig.

Welding Methods

In many instances the time that the fuselage was in the jig was being held at a minimum by the practices of bench welding and using the jig for tacking only. Bench welding is usually more economical than floor welding and in the case of the fuselage structure some manufacturers prefer to tack the side panels completely on the bench. These panels are then placed in the jig after which the connecting top and bottom members are tacked in place.

Another method of fuselage construction is to place all of the tubular members in the jig and then starting at the tail post weld both sides of the fuselage simultaneously working forward to the engine mount. In either of these fuselage assembly methods the tendency is to do only tack-welding in the jig. The fuselage can then be removed from the jig where all tack-welds are finished by skilled aircraft weldors. This practice makes it possible to greatly

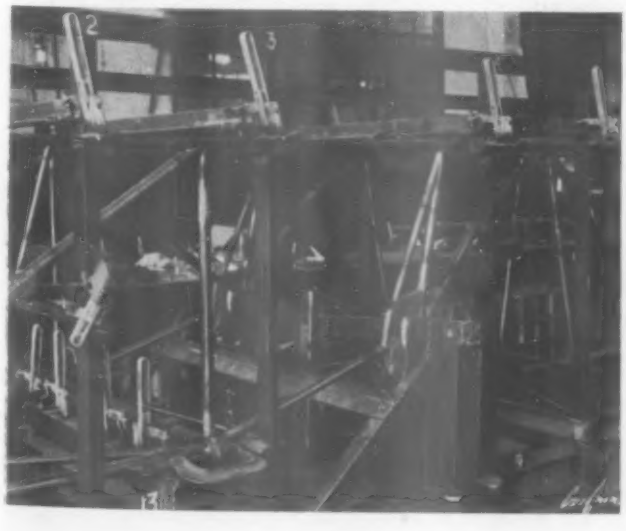


Fig. 3—A close-up of quick-acting toggle clamps used on a modern fuselage jig.

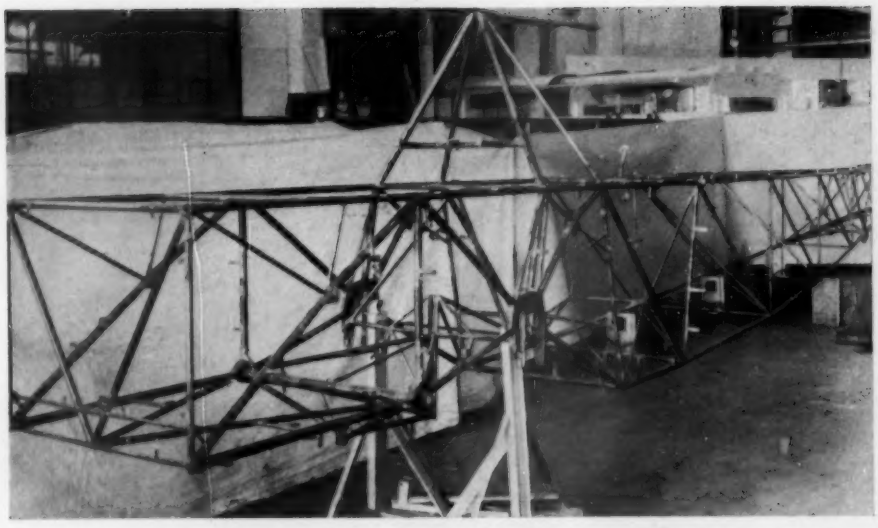


Fig. 4—The fuselage upon the completion of welding.

increase the output of fuselage that might be obtained from a single jig. Consequently increased production can be obtained without increased investment in jigs and at the same time weldors are able to finish the fuselage welding quicker because they do not have to "dodge" the jig frames during welding operations.

Time studies were made in one aircraft plant to determine why so much time was necessary to "jig" an airplane fuselage for final tack-welding. On this particular fuselage the bench welded side panels were placed in the final assembly jig for completion of the tacking. To the amazement of everyone it was found that it took longer to "close-up" the jig i.e., bolt every part of the jig frame so that the fuselage tubes would be held in alignment than was required for the tack-welding operation. In fact, closing-up the jig required 4 hours!

Clamping Devices

Immediately it was seen that this was a bottleneck on the fuselage production line. To relieve this situation it was decided to replace bolts in the jig frame with quick-acting toggle clamps. A fuselage jig which has been so constructed is shown in Fig. 2. This installation of 44 toggle clamps made it possible to reduce the time required for setting up and closing the clamps holding the fuselage in the jig to 20 minutes. In Fig. 3 is shown a closeup of this toggle clamp installation. It will be noted that the toggle clamps have been welded in place on the jig frame. These are stock clamps the only addition being an adjustable screw on the clamping bar, this addition permits more secure holding without using blocks or shims under the arm of the clamp. A completed fuselage is shown in Fig. 4.

Other examples of jigs and fixtures used in aircraft assembly construction are shown in Fig. 5. Here again quick acting toggle clamps are employed advantageously. By careful consideration as to the proper location for the clamp and the addition of a long foot to the clamp arm it was possible to make one clamp serve a dual purpose on the fixture used for a foot pedal.

After the foot pedal is welded in the position shown, it is "flipped over" so that the other side can be welded. Even in this new position the long foot of the toggle clamp will still hold this item in the fixture.

Smaller Jigs

The second fixture, which is used to hold the oleo strut arm during welding, has two toggle clamps of standard design. The rings and gland shown on the strut are added after weld has been completed.

The application of quick acting toggle clamps in the modernization of aircraft jigs and fixtures is only one of the steps that is being taken to keep aircraft production facilities up-to-date. As the toggle clamp is finding new places and uses on the production line, so is welding finding more widespread acceptance. All of the welding processes are being used in the aircraft factories, not only for the production of airplanes but for the production of tools to be used in producing aircraft.

The illustrations appearing in this article are credited as follows: Figure 1—Howard Aircraft Corp., Chicago; Figures 2, 3, 4 and 5, Danly Machine Specialties, Inc., Chicago. **THE END**

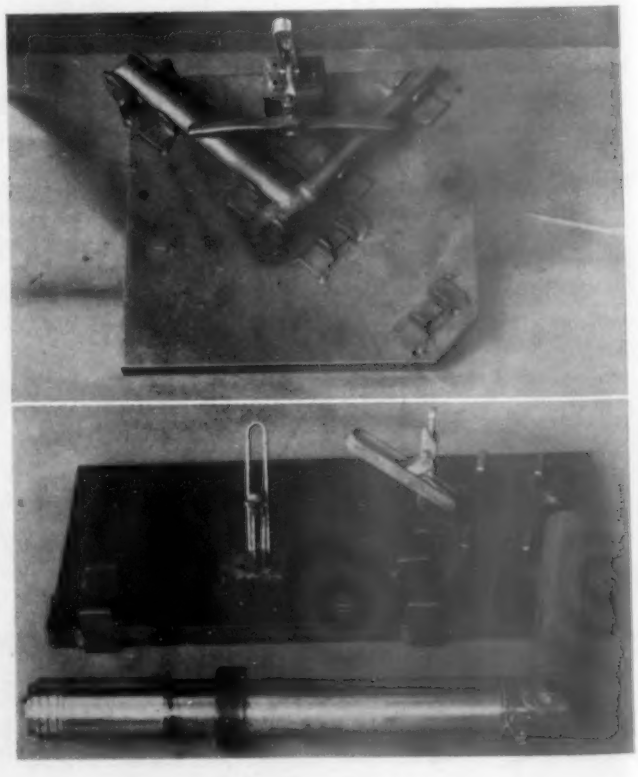


Fig. 5 — Small parts are quickly aligned in jigs like these.

★PRODUCTION

Interlocking steel channel flooring fabrication.

A-C Welding at Belmont Iron Works

By W. E. HENDRICKS, Plant Manager

Belmont Iron Works, Philadelphia

Welding has been used for years in steel plants, recently however, A-C welding has been found most advantageous for use in structural fabrication. Some of its many applications and possible advantages are pointed out in this article.

ARC WELDING at the Belmont Iron Works began in 1924 with the acquisition of two d-c motor-generator arc-welding equipments. In those early days the use of welding was not extensive and their first use was primarily one of experimentation. This was so much the case that only two men were selected from the ranks of the shops employees to be trained in the use of the electric arc. The training that they received would in no sense of the word be considered adequate under present day standards but at that time it was thought to be quite complete. In our particular industry there were few companies that used arc welding and in no company was it employed more extensively than the Belmont plant.

During this experimental development period, welding in the shop, using bare electrodes the only type then available—was a supplementary thing. It was considered ideally suited to plugging holes, tying in cutouts necessitated by poor fit of fabricated members and maintenance work such as repair of wornout shafts or gears, and many other unimportant auxiliary jobs.

Welded Fabrication

Further application of welding, however, came rapidly and following the introduction of coated electrodes and its rate of extension in the conservative iron and steel fabricating industry such was phenomenal. The definite demand for welded fabrication lead the company to increase many fold that of our modest start.

At the first news of a-c transformer welding we were skeptical of its application to our work. One prominent equipment manufacturer rather convincingly pointed out the economic advantages to be derived from the use of a-c transformer welders. Claims made were first, that metal could be deposited at a higher rate due to the welding characteristics of the a-c arc. This higher rate naturally would reduce the cost of weld per foot, and secondly, the equipment itself costs less to buy. After seeing some of its results and after discovering that its use was acceptable to the various authoritative agencies gov-

This heavy steel girder in the process of fabrication by A.C. welding is for use in building construction.

erning the use of welding in general, it was decided, in July of 1933, to try it on our work.

Advantages

In actual use, it could be seen that the advantages to be derived in structural fabrication although somewhat limited as to the class of work, were definite and bona fide. These limitations were brought about by the fact that reverse-polarity electrodes and most lightly coated electrodes cannot be used successfully with alternating current. For our type of work, this characteristic limits its use to downhand welding operation where, of course, large, fast-melting electrodes can be used to advantage.

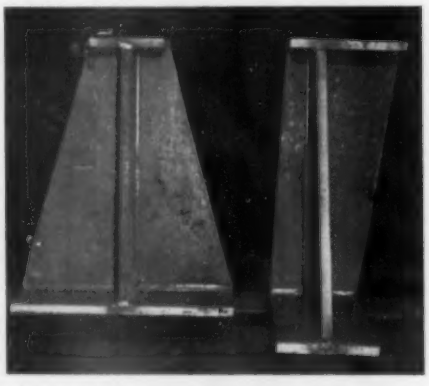
It was found that the claims for speed of a-c welding were well founded because a rod of a given size could be used with an appreciably higher heat than was possible with direct current. Further tests determined that larger rods could be used due to the diminished undercutting characteristics of the a-c current.

Possible Saving

In recent deposition tests of 30 different shielded-arc, mild-steel rods, it was ascertained that of the three cost elements involved, namely, 1.—labor (or the time element), 2.—cost of rod, and 3.—cost of power, the proportionate costs were labor 57%, rod 30%, and power 13%. Thus, it can be seen readily that the time element, (labor) is the most significant and where a definite time saving can be made, the effect on the ultimate cost is considerable.

Through the combined economy brought about by the use of larger rods, (where feasible) and the increased heat, the saving gained by a-c welders was computed on the basis of deposition tests to be somewhere in the neighborhood of 15 per cent in rate of deposit, which is equivalent to 8½ per cent saving in operating cost of depositing weld metal. This saving combined with the reduction in investment carrying charges and depreciation results in a probable net saving of 10 per cent.

In these days of highly competitive business it is not infrequent that a 10 per cent margin is the difference between profit and loss.



A.C. welding makes possible the fabrication of these pedestals without "arc-blow."

Conclusions

The use of a-c welding has simplified the application of welded design to structural work to a degree that was not possible with d-c welding. In many instances it has been found that inaccessible with shear plates and seams with seams, such as bases of column bad fit, are more easily welded with the a-c arc. There is considerably less arc blow, and not as great a tendency toward undercutting. And, so far as welding operators are concerned, it is safe to say that any welder is better satisfied with his work when it presents a smooth appearance, free of blow-holes, undercut, and starting or stopping craters. In our type of fabrication, this desirable result is readily achieved through the use of a-c welding.

THE END

The fabrication of a machine base for rolling-mill equipment by A.C. welding. (All photos by General Electric Co.)

Suspending the screw in a vertical position eases the welding job.

Arthur Havens

on

Rebuilding Locomotive Stoker Screws

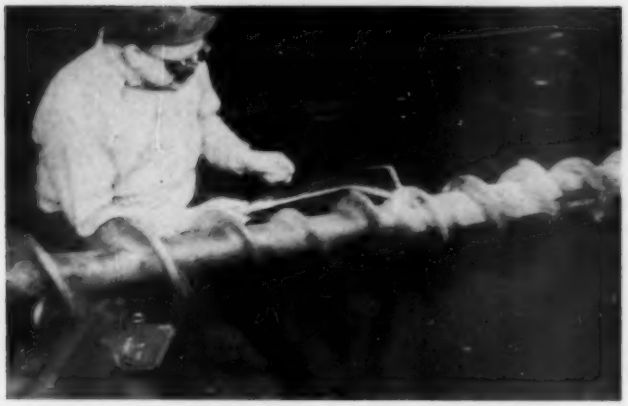
★ The widespread use of welding is greatly reducing railroad maintenance expenses. The Elevator and Conveyor Screws of locomotive stokers represent two of the many places in which welding has been found to be an excellent repair tool.

A STOKER SCREW too badly worn to reclaim doesn't make sense to the experienced welder. He knows that by suitable preparation and by following a few simple steps in procedure control it is possible to rebuild practically any elevator or conveyor screw. Not only can it be rebuilt but it will be fully as good as a new one and will be obtained at a saving which will be well worth the time and effort that this welding operation will take.

The Duplex stoker using the rack and ratchet drive is one of the popular types of stokers used on locomotives. This type of stoker consists of a long conveyor and two short elevators for transferring coal from the tender to the fire-box. Although all parts of the stoker receive a tremendous amount of wear, the screws which are in constant contact with the coal get the most abrasive wear. This wear is so severe that often screw flight, originally over ½" thick, is worn to a feather edge.

The Elevator Screw

Shortest and easiest to reclaim, of the stoker screws, is the elevator. Since the flight is usually worn thin and well under its original diameter, the usual procedure is to replace the lost metal by welding a band of steel along the edge of the flight. To do this the screw should be placed in a lathe and turned to a diameter of 1¼ in. under the original finished size. It is now returned to size by wrapping a ⅝ in. square steel bar along the edge of the flight. Starting at the bottom of the flight this square bar is tacked securely to and flush with the edge while the screw is in a horizontal position. The screw is blocked so that it will not roll and the bar is heated with the welding torch, as it becomes hot the bar is bent to follow the machined edge of the screw. An occasional twist with a monkey wrench will keep the bar square with the flight. During this wrapping operation the steel bar should be tacked every 10 in. to hold it securely. This oper-



In certain areas hard-facing may be applied advantageously.

ation is continued until the bar has been tacked the full length of the screw.

Upon completing the tacking operation the elevator is now placed in an upright position for welding. This may be accomplished with chain falls or by dropping the elevator over a pipe fastened upright on the floor as is shown in Fig. 1.

Welding is started at the bottom of the screw. The operator using large welding tip to melt two 5/16 in. rods at once begins to fill the space between the ⅝ in. bar and the hub with weld metal. This operation is very rapid because it is a wearing surface and does not require great strength. A good grade of steel rod should be used for this application. Welding rods used to weld locomotive tires and other parts subject to high abrasive wear, makes an excellent rod for this purpose.

When the hub of the elevator screw is worn it can also be rebuilt to its previous size. This application is quite similar to that of rebuilding a round shaft. In this case the desired results may be obtained readily using either the arc or oxy-acetylene process.

The Duplex conveyor presents a slightly different problem because of its length and taper. It is very difficult to trim the flight of the conveyor so that it might be rebuilt by applying a steel bar as in the case of the elevator. The simplest way to gain this end is to secure the screw in the lathe as if it were going to be machined. After the tool holder has been removed a cutting torch is fastened to the tool post of the lathe. Then as someone turns the face plate or chuck by hand, the torch is adjusted to trim the flight at the proper depth and as the hand feed on the carriage is manipulated. The torch thus follows the flight of the screw to produce a very neat surface suitable for applying an applicator bar. The bar stock is now tacked to the conveyor flight the same as in the case of the elevator.

The welding of the flight of the conveyor screw after it is upended is a much more difficult job because it is almost twice as long as the elevator. A splendid idea for holding this long screw while welding is to cut the head from a scrap locomotive reservoir and to sink the reservoir in the floor. The long conveyor screw is then held vertically over this improvised pit by crane or hoist, as the welding progresses the screw is lowered into the pit. This plan of operation is much safer than if the weldor were required to build a staging to raise himself as the point of welding gets out of reach.

The Standard stoker embodies many different ideas in transferring the coal, there is only one elevator and a shorter conveyor. These screws are so formed that it is impossible to machine them to prepare them for a square steel bar. In this case the flight is calipered and when the size is determined a piece of round stock of sufficient size to return the flight to its original diameter is tack welded to the edge of the flight. If the wear is less than ¼" it may be built up more easily with torch and rod.

That portion of the conveyor which is subjected to the most wear are those flights in the crusher zone, in fact, it is not infrequent that these are the only places on the conveyor which show wear. This is an excellent spot for the use of hard-facing. An application at this point will increase the life of the screw many times. The teeth on the crusher should be rebuilt with a good grade of wear resisting steel.

The base of the transfer hopper often wears when it becomes loose. Sometimes the wear on this cast iron piece is as much as ¼ in. It can be rebuilt easily, however, if it is ground bright and filled with bronze. Hammering the bronze while it is hot will save subsequent grinding or filing.

The bearing on the short drive shaft is usually worn and needs changing whenever the stoker is overhauled. Some shops plan to have a spare shaft on hand so that when a worn shaft is removed from a stoker it is rebuilt by welding during slack periods. After rebuilding it is machined to size and kept ready for the next overhaul. The same plan will work equally as well for the elevators and conveyors. When the worn screws are removed they are taken to the welding job where they are rebuilt in spare time. This procedure always keeps available a supply of spare parts ready for instant use.

The worn surface between the applicator bar and the hub is filled with weld metal.

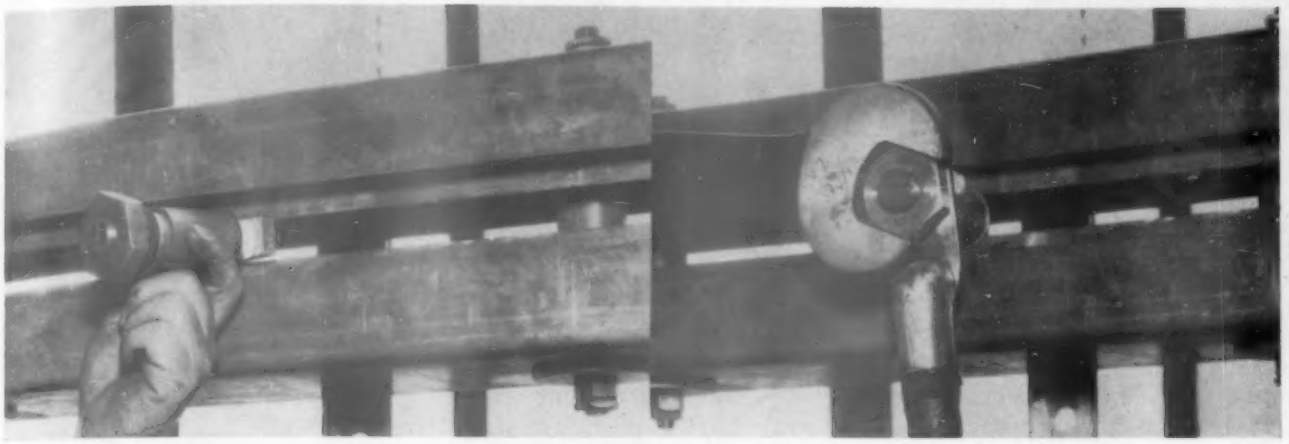


Fig. 1—It is easy to make connections wherever desired on concentric channel conductors.

A Concentric Channel Bus for Resistance Welders

By
W. SPECHT
Philadelphia Works
General Electric Co.

★ Increasing production facilities usually calls for added equipment installations. When additional resistance equipment is installed it is often necessary to install power circuits of higher current carrying capacity. The use of concentric channel bus bars will avoid these difficulties.

WHERE single phase spot welders are used in steel fabricating shops and other plants welding equipments are naturally located close to the work. Some pieces of equipment are of the portable type, while others are so constructed that they can be relocated to suit changing conditions. Electric circuits feeding such welders must carry exceptionally large current during the welding operation, consequently a considerable drop in voltage occurs at the welding location when an ordinary laminated copper bus of economical size is used as the supply conductor.

Low Reactive Drop

To overcome such a condition a single phase, concentric channel bus was recently developed. Since this new type bus structure is comparatively small; it keeps down the reactive drop and skin effect; it is easy to install; it may be tapped easily at any location for welder connections and in addition it is easily installed.

In the new bus structure, concentrically arranged channels form a double hollow square. (Fig. 1). The channels are held apart by steel and porcelain spacers, thus forming a slot through both channels to provide ample ventilation.

Porcelain insulators separate the inner and outer channels and provide sufficient creepage for the rated voltage. Tie bolts, encased in insulating tubes, are spaced sufficiently close to hold the structure together against those mechanical stresses set up by short circuit currents.

Simple Connections

Connections may be made to the inner pair of channels at any point by means of a copper stud. (Fig. 1). One side of the rectangular head of the stud is narrower than the slot between the inner channel flanges so that it may be inserted in the slot and then turned 90 deg. and fastened to the inside of the inner channel by tightening the stud bolt. The rectangular head contains two line contacts which bear against the channel. One of the welding conductors is then fastened to the outer end of the stud while the other is usually fastened under the bolt in contact with the outer channel bus.

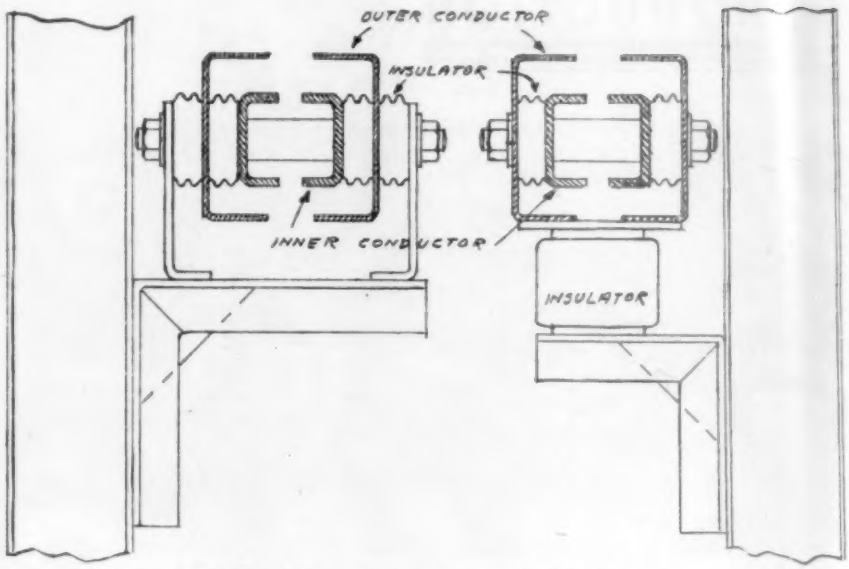


Fig. 2—Concentric channel bus bars may be mounted in different ways as long as they are insulated.

The concentric channel bus may be used on either grounded or ungrounded systems, but in either case insulation between both conductors and ground is required. This might seem to be unnecessary on the ground conductor but it serves to prevent stray currents through other ground paths which would mean less effective control of the voltage drop by the concentric bus (Figure 2). Protective covering may be provided for the bus by adding a housing (Fig. 3).

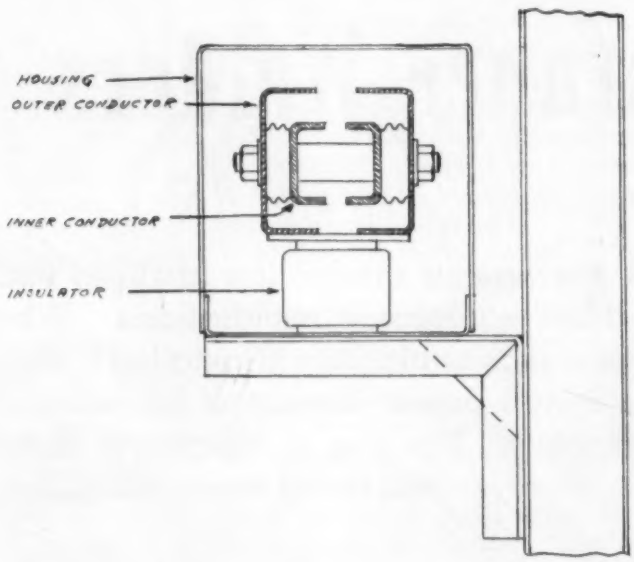


Fig. 3—This housing provides an excellent protective covering.

High Current Capacity

A four-inch concentric channel bus of this construction with a continuous carrying capacity of approximately 3200 amperes at 30 deg. C. rise in open air will ordinarily handle a load five to six times that amount without exceeding 30 deg. C. rise on the bus copper. This is possible because not all of the welding machines are in operation at the same time and also different duty may be employed for different work.

Actual tests on the installed concentric bus show the reactive drop to be 12 x 10^{-5} volts per foot per ampere, or only about 28 per cent of the reactive drop of two hollow square channel buses placed side by side on seven-inch centers. (Fig. 4).

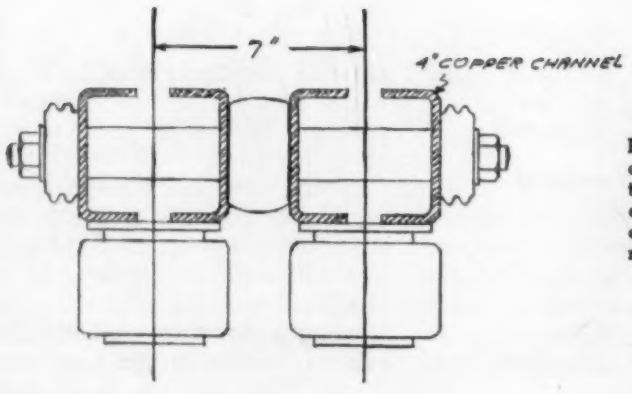


Fig. 4—Concentric channel conductors are more efficient than hollow channel buses arranged as shown.

THE END

Now Is The Time To Join
AMERICAN
WELDING
SOCIETY

Exhausters draw away fumes.

Welding Enclosures Speed Work

Improved welding enclosures not only improve working conditions but facilitate material handling.

PLANT expansion and the resulting relocation of several production departments at the Reliance Electric & Engineering Co., Cleveland, made it possible to introduce some improvements in the facilities afforded the men who handle the welding operations. More comfort and convenience for the welder was emphasized in these changes.

The first improvement was concerned with introduction of canvas enclosures for the welding booths. The only rigid part of the enclosure now is the plant wall against which all the booths are located. Three sides of each booth make use of regular brown welding canvas, hung at the corners from standard 125 lb. weighted base safety zone stanchions, 6-ft. 2 in. in height. To each there is bolted a light sheet steel strip which projects approximately 12 in. on either side of the upright to prevent injurious light rays from passing through the curtain junctions, and to provide a snug enclosure of each booth. The stanchions used at the corners of the booth have two of these light sheet steel strips bolted at right angles to each other to form tight corners. Eyelets in the top corners of each section of welding canvas permit fastening it securely to hooks in the stanchion tops.

This method of holding the enclosures in place is important because it eliminates wires or pipe supports across the tops of the booths, permitting much greater freedom and safety in depositing work from overhead cranes. Making the canvas its own means of suspension leaves nothing solid to run into or tip over in bringing work into or out of a booth. The hook and eyelet arrangement makes it possible to take the curtains down or put them up quickly and easily.

The canvas is of standardized size (10-ft. in width by 5 ft. in height) to facilitate its interchange with other departments where similar enclosures are used around engine lathes as protection against flying chips, around spot welding operations to guard against flying sparks, and around other work to corral flying nails, metal particles, etc., that might endanger passers-by.

Ordinarily the welding booths are kept to 10 by 10 feet in size. This area has been found large enough for the handling of regular work. However, should the size of the work necessitate it, spare curtains and stanchions are put up to make the booth enclosure 10 by 20 feet, or larger in any desired combination of 10-ft. additions. All of the interior of a booth is made available as working space; bulk supplies are kept outside the booths to decrease the hazard of an operator's bumping into or stumbling over them inside.

The second improvement, made possible by the new location of the welding booths, is concerned with the method of ventilation that has been worked out. The basis of the system is the use of a low volume of air at a fairly high velocity—545 cu. ft. of air per minute per intake at approximately 4-in. static pressure. A 15-ft. length of flexible tubing, 5 in. in diameter suspended on light airplane cable and individually counterweighted, is dropped into each booth from an overhead main ventilating line serving all welding stations.

Each tube has a ball end (screened since one of the welders lost his cap up one of the pipes) and is just the right length to be readily maneuverable around and above the work. No tube is long enough to touch the floor or to be laid on it.

Where especially large pieces of equipment are being welded and must be handled at some distance from the regular booth enclosure, 5-ft. extensions of flexible tube are provided which can be added on to any one of the regular lines.

Another improved feature for the new welding booths is the location of two jib cranes over the line of booths. These cranes are so placed that they can serve a wide area in picking up and depositing work inside any one of the booths with a minimum of interference to operations already in progress.

The absence of rigid frames makes equipment and material movement easier.

THE TECHNICAL SLANT

A true University of these days is a collection of books.—Carlyle

Aviation

FLIGHT—FIRST PRINCIPLES. *By Capt. Bailey Wright, James J. Smiley, Jr., Rex Martin and others. Published by American Technical Society, Chicago, 1941. Cloth, 6 x 9 in., 288 pages. Price $2.50.*

FLIGHT—CONSTRUCTION AND MAINTENANCE. *By Capt. Bailey Wright, W. E. Dyer, Rex Martin and others. Published by American Technical Society, Chicago, 1941. Cloth, 6 x 9 in., 264 pages. Price $2.50.*

These companion volumes have been written to give the reader the fundamentals of aviation required for both pilot and mechanic training. The problems and theories of these two branches of aviation are thus discussed in two illustrated volumes.

Flight—First Principles discusses the pilot's phase of the aviation industry. In the opening chapter there is discussed the historical phases of transportation from early times to the present. There is also an interesting discussion of the history of aviation and memorable flights. Subsequent chapters deal with the nomenclature of aeronautics; flight theory and aerodynamics; safety, in which there is given an excellent discussion of aircraft maneuvers; soaring and parachutes, as well as step by step on the procedure of packing parachutes

The value of the book is further enhanced by a series of questions and answers which should prove helpful in passing the CAA pilot's examination.

In the second book, Flight—Construction and Maintenance, the problems of building and maintaining aircraft is discussed. The manner in which the material is presented leads one to believe that nine authors cannot collaborate successfully in the preparation of such a book.

The book is in eight chapters which discuss blueprint reading, woods, metallurgy, oxy-acetylene welding, construction, rigging, repair and propellers. In some cases the material covered is duplicated in several places in the book. for example, welding is referred to in three different places, yet nothing of value is added to the material found in that chapter devoted to oxy-acetylene welding. At the same time resistance welding. which has been quite important for several years in aircraft manufacture, is hardly mentioned, while even less is said of arc welding. The use of welding symbols which are not the accepted standard and references to business firms which have been non-existent for a number of years leads one to question as to whether or not much of the material presented is not out-of-date.

Supplementing the text is a home study quiz consisting of a number of questions with their answers which should prove quite valuable to the student interested in aircraft mechanics.

Airplane Welding

AIRPLANE WELDING AND MATERIALS. *By J. B. Johnson. Published by Goodheart-Willcox Co., Inc., Chicago, 1941. Simulated leather, 5 x 8 in., 409 pages. Price $3.50.*

Airplane Welding and Materials is a revised edition of Airplane Welding by the same author which was published in 1929 and as such it has been enlarged by over 100 pages. Like its predecessor, Airplane Welding and Materials is the best book, to date, that has been written on the subject of airplane welding and it fills a spot in this sadly neglected phase of welding literature.

In the new material presented is a chapter on resistance welding which gives a somewhat more complete discussion on this subject than appeared in the earlier volume. The chapter on aluminum welding has been rewritten and there is also included a chapter on magnesium welding.

It is unfortunate, however, that Mr. Johnson attempted to cover both airplane welding and airplane materials in a single volume. The outcome indicates that neither has been treated too well. Instead the "physical testing of metals" appears to be the main theme of the book, at least the longest (53 pages) of the book's thirteen chapters are devoted to this subject. In addition physical testing and related subjects are touched upon in six chapters.

It is believed that the book could have been made much more valuable had greater emphasis been placed upon the welding of some of the newer alloys used in aircraft construction. Likewise it seems that more information should have been included on the welding technique required and pitfalls to be avoided as well as further information on spot-welding and its increasing importance in the aircraft industry.

» «

Success

HOW YOU CAN GET A BETTER JOB. *By Willard K. Lasher and Edward A. Richards. Published by American Technical Society, Chicago, 1941. Cloth, 5½x8½ in., 180 pages. Price $1.50.*

In How You Can Get a Better Job two experienced counselors have set down their thoughts on the subject of self-improvement in a very interesting way. The information presented is of excellent character and if followed, the effort would probably produce results.

How You Can Get a Better Job is divided into three parts. In the first part which discusses the human element, it is pointed out the importance of teamwork, cooperation, human interest and your voice. Particular emphasis is placed upon the importance of a pleasing, interesting voice, and how to use it for business success. Don't be afraid to speak in public.

Part Two is devoted to self-management. By a breakdown of the hours in a week, the authors show that we have very little leisure time and should make the most of it.

The final portion of the book is on selling yourself which discusses subjects of interest to us all, including: How to find a job; how to ask for a promotion; and how to ask for a raise.

For those who are willing to follow instructions, this should prove to be a very helpful book. It is unfortunate that so many persons read books of this nature yet never follow the advice given.

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Government

SMOKE-SCREEN. *By Samuel P. Pettengill. Published by America's Future, Inc., New York, 1940. Cloth, 5½x8½ in. 126 pages. Price $1.00.*

Smoke-Screen is a book written by a former Indiana Congressman and is designed to enlighten the public on the general tendency of this country to drift into National Socialism. It contains many enlightening facts on the manner in which billions have been squandered in Washington to build the greatest bureaucracy this country has ever known. There is pointed out the manner in which the New Deal bureaucrats have fastened political control upon big and little business, framing finance and professional activities. All in all Mr. Pettengill has written an interesting book on the dictatorial tendencies of our government.

Since this book was written before the election and our present war hysteria period, a sequel to this volume covering the past eight months would undoubtedly prove extremely interesting.

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Tubing Design

AIRCRAFT TUBING DATA. *Edited by John E. Younger. Published by Summerill Tubing Co., Bridgeport, Pa. Paper, 9½x11½ in., 142 pages. Price $1.50, $2.00 with ring binder.*

In this one volume there will be found practically all of the engineering data desired on aircraft tubing.

Aircraft Tubing Data is a four part book on the subject. In the first section of the book there is given general information on tubing; manufacture, specifications tolerances, heat treatment and mill shapes. Fabrication is discussed in section two with many illustrations and other data applicable to welded design as well as inspection bending and corrosion protection. Section 3 presents design data including charts and curves, tables of tubing properties and aircraft tubing formulas. In section 4 will be found many of the commonly used handbook reference tables.

For those interested in aircraft tubing design, this should prove to be an extremely valuable volume.

Brief Sketches of Welding Jobs

Spot welding 199 1/32-in plates by pulsation welding.

199 Pieces at One Time

Pulsation welding, one of the many recent advancements in resistance welding, enabled the temperature to be equalized across an entire assembly of 199 plates of 1/32-inch low-carbon steel, making a satisfactory weld at the General Electric Works Laboratory, Schenectady, N. Y.

Looking on while this weld is under way is J. H. Redmond of this laboratory who developed pulsation welding. According to Mr. Redmond, no practical need is seen at this time for such large-scale welding of pieces, but this is one answer for those who have asked "How many pieces of metal can I weld together at one time?" And 199 pieces is not the limit!

» «

A Hawaiian Penstock

The Light Company of Hilo, Hawaii, has just completed a new 7,000 ft. penstock which was fabricated and field welded entirely by the electric arc process. One-third of the penstock is 48. in diameter with 3/8 in. wall thickness. The other two-thirds has 1/4 in. plate walls. One-half of the lighter pipe is 54 in. while the other half is 60 in. in diameter. A field section was 16 ft. in length, composed of two 8 ft. sections arc welded together in the shop.

Elbows, some of which were 20 degree, were also shop fabricated by arc welding using jigs for rounding the pipe, fitting the butt straps, etc. No previous laying out was necessary. During fabrication, longitudinal seams were all butt welded without bevel. Approximately 12½ tons of electrodes were used.

After the line was completed, a test was made at 270 pounds pressure and not a leak was discovered. It is interesting to note that all the welding on this penstock was done by men born and raised on the island and trained particularly for this work.

A native weldor at work in Hawaii.

« »

Completed Tank on Automatic Positioner that Cut Welding Time in Half.

Welding Speeds Production

Significant at a time when man-hours are so vital to industry is this example of a job that was speeded up by arc welding. This particular job, a tank to be used for quenching all-welded gears after heat-treatment, is a striking example of the advantages of welded over riveted construction. In addition to speeding up production, the welded construction met two other important requirements. It cut the weight approximately one-third and provided an easy way of making the tank waterproof and able to withstand pressure.

At the Harnischfeger Corp., Milwaukee, where the tank was manufactured, the entire welding operation was performed with the aid of an automatic positioner. By positioning the welding time was cut approximately in half!

The tank, 10 feet deep and 6 feet in diameter, made of one-half inch mild steel plate, was made in two five-foot sections and welded together. As the illustration shows, the seams were staggered for strength and to prevent distortion. All joints were beveled to 45° to insure complete penetration and secure a waterproof tank.

It is interesting to note that the 2,600-lb. weight of the tank after construction is 33% less than the weight of a similar riveted tank.

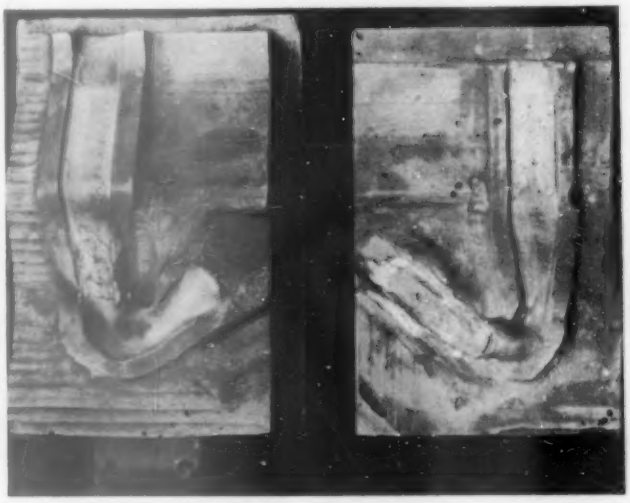
» «

Hard-Facing for Dies

Die reclamation by welding is becoming an increasingly important means of reducing die maintenance. Where it was formerly required that cast iron dies be replaced when worn it is now found that hard-facing applied by a welding torch will not only repair them but greatly increase effective life.

The manner in which hard-facing will increase the life of forming and drawing dies may be determined from the above photo. Before hard-facing was used in their reclamation, their life was two months—after hard-facing two years.

Die reclamation is only one of the many uses that is now being found for hard-facing materials. These wear and corrosion resistant hard metals are finding use wherever there is a desire to retard or reduce wear.



Drawing Dies which have been reclaimed by hard-facing (Photo Wall - Colmonoy Corp.)

Taking the Welding Shop to the Job. (Photo Hobart Bros. Co.)

Field Repairs Save Time

Many tractor owners are not aware of the dependable practice of rebuilding worn tractor lugs by arc welding. An enterprising job shop operator will take his portable gasoline engine-driven arc welder to the job and rebuild tractor lugs by welding on ¾ in. by 14 in. bars of steel. In addition to saving the contractor about $100 less than the usual replacement cost, the job shop will make a nice profit. The customer is further pleased by the fact that the tractor is out of service only about one-fourth the usual length of time.

» «

Resistance Welding Lamp Filaments. (Photo General Electric)

Spot Welding in Miniature

At General Electric's General Engineering laboratory in Schenectady, nickel-chromium wires but 1/2000 of an inch in diameter (¼ the thickness of a human hair) are being spot welded together into tiny filaments for sensitive thermocouples — small tube-like devices (about size of small flashlight bulb) used to measure high frequency, alternating currents or voltage.

Each filament consists of three pieces of wire, spot welded into a K shape. The filament itself is then spot welded to the posts of the thermocouple stem. So detailed is the work that the operator must use a microscope to see the wire and a pair of small tweezers to hold the wire. Dexterity, keen eyes and patience are the prerequisites for this exacting job.

» «

Preheating Aids Welding

Like 'most everything in Houston, Texas, the metal working industries are booming. What with the Houston Ship Canal, the increasing movement of heavy industries to the South and its supplies of natural gas, and the war's effect upon steel and oil and chemical production, the Wyatt Metal and Boiler Works, Houston, is gearing up for more business—business involving the design, fabrication and erection of welded tanks, pressure vessels, pipe and whatnot executed in steel plate up to 5 in. in thickness.

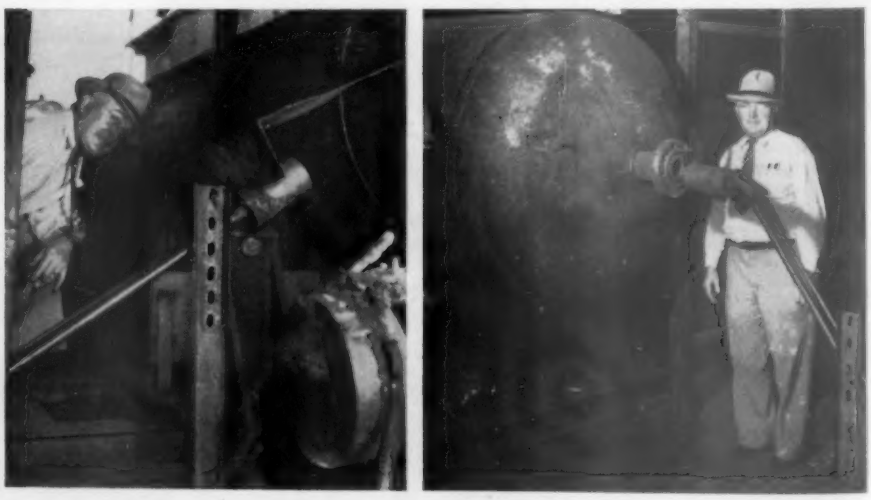
As a part of this "gearing-up" program has been the installation of a number of flexible, movable, compressed air-natural gas preheating torches as are shown in the accompanying illustrations. On the left may be seen a preheating torch which has been adjusted to throw its flame on the butt joint between two halves of a 2-in. thick pressure vessel. So that the preheat is evenly distributed prior to welding, the vessel is slowly rotated on rollers. In the right-hand view is shown a preheat torch aiming hot air at one of the 42½-in. trays of an oil refinery absorber—to preheat it for easier and sounder welding of the 2¼-in. shell. This weld when completed must withstand a working pressure of 1200 pounds per square inch.

This guard supports itself.

Self-Supporting Cattle Guards

Cattle guards required on all oil-field leases where grazing rights are retained by the landowner, require end pieces to prevent cattle from passing between the guard and the edge of the roadway. Such end pieces normally are supported on the guard proper and by a post at the farther edge. To eliminate the cost of setting these outer posts, a welder attached paired stub pieces of heavy pipe to the base of the transverse member of the welded guard triangle, making them long enough to engage against a cross member welded below the roadway elements.

By welding loops of rod to the grill to retain the base leg ends of the triangle, the triangular end piece may revolve about its base leg until the stubs strike the transverse member, thus holding the side piece at the desired angle. For moving the guard or transportation prior to setting, the design permits the side pieces to be folded flat across the grill without requiring the space which would be needed were the sides permanently fixed at the desired angle.



Preheating Reduces Welding Time. (Photos American Gas Association)

New Product Developments

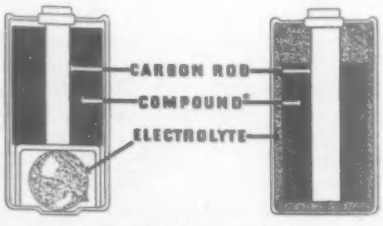
A modern prespiration retainer.

Perspiration Retainer

Mine Safety Appliances Co. announce a new **M.S.A. Coolband**—a modern perspiration retainer for men on hot jobs. The Coolband betters hot working conditions by keeping sweat from the eyes, and goggles or glasses. It is said to stop continual face-mopping and other deterrents to continuous work arising from uncontrolled head perspiration.

The M.S.A. Coolband offers all-around-the-head absorption. It consists of a soft, flexible band which encircles the head—clinging softly without binding, and creating a cooling effect through constant absorption of perspiration. Sanitation is easily maintained, and the COOLBAND may be disinfected at will. Any part of the band can be quickly and easily wrung out. Complete details may be secured by writing this publication, or direct to Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa. Ask for Bulletin No. CE-13.

» «



Long storage life for this battery.

Flashlight Cell

Long storage before actual use is no longer detrimental is the claim of a new flashlight cell that has been developed by **Triumph** of Elkton, Md.

The **Triumph battery** is the same as the standard cell in size, shape, method of contact and voltage capacity but radically different in construction. It is packed and sealed in a dry state and activated only by striking the bottom of the case against any solid object. This action breaks an inner glass bulb thereby releasing the electrolyte which energizes the cell. 100% strength is said to be attained in less than a second. From that moment on, this cell is claimed to have the same characteristics as any other flashlight battery under the same conditions.

» «

Hack Saw

★ A new hacksaw frame has been introduced by the **Rapid Manufacturing Co.**, Glendale, California. The 12-inch combination model makes instantly available both standard and taper frames. Only 30 seconds is required to change from one frame to the other or place the blade in position for straight and angle cuts.

All Rapid models have the patented automatic tension lock. This cam action in the steel handle locks the blade in place with more pull tension than any other frame. The frame design in the Rapid taper model makes possible cutting below the level of the handle, for deep cuts. Blades are interchangeable for metal, wood, plastic or bone. A complete line of Rapid automatic tension hacksaws includes 10" machinist saw, 12" standard model, 12" and 14" heavy duty frames, the 12" taper model and the 12" combination saw.

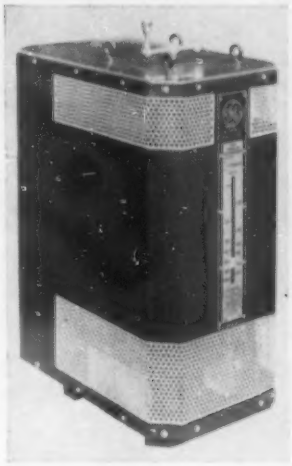
This hack saw saves knuckles.

G-E Improves Design of Atomic-Hydrogen Arc Welders

★ **General Electric** 35- and 75-amp. atomic-hydrogen arc welders of improved design at prices reduced approximately 15% have recently been made available. These units are finding increasing use in industry it is said for repairing tools and dies; for filling in flaws or blow-holes in steel and bronze castings; and for the fabrication and repair of hard-to-weld metals.

Modern in design, the new welders are compact and self-contained to reduce space requirements and for increased portability and pleasing appearance.

Instead of the transformer and reactor used in previous units, the new welder has a specially designed reactive transformer which combines the functions of both the transformer and reactor. As a result, the weight of the welder has been reduced more than 30 per cent, and electrical characteristics improved.



A low amperage welder.

Built-in power-factor correction, a feature of the new welders, the makers point out, helps to reduce installation cost and avoid power-factor penalties. Fan-forced ventilation provides cool operation, even at high currents or on high duty cycles.

» «

Welding Goggle

★ A new line of welding goggles has just been introduced by **Bausch & Lomb**, Rochester, N. Y., which have safety features not found in other similar type welding goggles. The new goggles, known as **"Arc-Ban,"** are of the louver sideshield construction. The louvers are automatically located in such a way that there is a direct channel for air passage although all light is excluded.

The louvers are designed so that there are no projections either on the outside or the inside of the goggle which might cause abrasion or injury.

The lightweight composition cups are designed to conform to facial contours and fit all types of faces. Two models are offered to take care of workmen with corrective spectacles and those whose eyes require no correction.

Safety goggle of lightweight construction.

News of the Industry

A.S.T.E. Elects

Frank W. Curtis, Chief Engineer, Milling Machine Division, **Van Norman Machine Co.,** Springfield, Mass., was elected President of the **American Society of Tool Engineers** at the annual meeting of the Board of Directors of the Society recently. Mr. Curtis, formerly Chairman of the Springfield Chapter of the A.S.T.E., succeeds **A. H. d'Arcambal,** Chief Metallurgist, **Pratt and Whitney Co.**

Elected 1st Vice-President was **Otto W. Winter,** Factory Manager, Columbus, **McKinnon Chain Corp.,** Tonawanda, New York. Mr. Winter, who is also National Chairman of the Society's Emergency Defense Training Committee, succeeds E. W. Dickett, Proposal Engineer, **Sundstrand Machine Tool Company.**

When you need
RODS for Special Applications
Call Ryerson

Large stocks include McKay Certified Stainless Electrodes, Alloy, and Hard Surfacing Rods.

For sound, strong, dependable welding jobs, choose Ryerson Rods—they're tops for speed, economy, and performance.

McKay Stainless Electrodes—carried in stock at 10 conveniently located Ryerson plants — lower fabricating costs . . . leave cleaner, smoother deposits . . . penetrate deeply . . . and have low spatter loss. Certified weld deposit analysis is stamped on each package — a definite advantage over core wire analysis which is often changed considerably in actual welding. The type is clearly die-stamped on each rod. Large stocks of many types and sizes assure prompt reliable service at all times. Write for bulletin. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

Ray H. Morris, Vice-President, **Hardinge Brothers,** Hartford, Conn., was elected 2nd Vice-President to succeed **E. A. Rutzen,** Ass't Works Manager, **Evinrude Motor Co.,** Milwaukee, Wisconsin.

Named Secretary was **Clyde L. Hause,** Sales Engineer, **Gorham Tool Co.,** Detroit, succeeding **Conrad O. Hersam,** Consulting Engineer, Philadelphia, Pa.

Frank R. Crone, Chief Tool Designer, Lincoln Motor Co., Detroit, was re-elected as Treasurer. **Ford R. Lamb** continues as Executive Secretary of the A.S.T.E.

» «

A.I.E.E. Summer Meeting

The **American Institute of Electrical Engineers** will hold its summer convention, June 16-20, in Toronto, Canada. Headquarters for the meeting will be at the Royal York Hotel where a full program of technical papers, inspection trips, entertainment and sports events will be presented. Full details may be obtained from the Institute at 33 W. 39th St., New York City.

» «

C.G.M.A. Meet

The **Canadian Section, Compressed Manufacturers Association** will meet June 13-14 at the Seignory Club, Montebello, P.Q. A luncheon at 12:30 will open the meeting which will be followed by the annual golf tournament. The usual business meeting will follow a dinner at 7:30. **Engineer Rear Admiral E. J. O'B. Croker,** Head of the British Admiralty Mission will be a guest and a speaker at the two-day meeting.

» «

Navy Department Needs More Inspectors

An effort is being made by the U. S. Civil Service Commission to meet the demand for inspectors of ship construction and engineering materials in the Navy Department. New examinations for these positions, with modified requirements, have just been announced. Announcement No. 81 for Inspector of Engineering Materials and Announcement No. 82 for Inspector of Ship Construction cancel and supersede Announcement No. 103 of 1940, the original announcement of the examinations for these positions. Persons qualified under the new examinations are urged to file application at once, although applications will be accepted at the Commission's Washington office until further notice.

Inspector of Engineering Materials

Positions pay from $1,620 to $2,600 a year and persons may qualify in the following optional branches: Steel hulls, mechanical, electrical, and radio. Although experience in the inspection or testing of engineering materials in the optional branches is required, applicants for the junior, assistant, and associate grades will not be limited to any specific optional branch. Substitution of mechanical or other related types of experience,

or of appropriate education, may be made for a part—or for some grades, all—of this inspectional experience. Except for the positions of junior inspector for which the maximum age is 35 years, applicants must not have passed their sixty-fifth birthday.

Inspector of Ship Construction

Positions pay from $2,000 to $2,600 a year. There are four optional branches of inspection: Electrical, mechanical, steel hulls, and wood hulls. Experience in testing or inspection construction or installation work is required, but for a part—or for some positions, all—of this experience applicants may substitute mechanical or other related types of experience, appropriate education, or possession of a marine engineer's license. The maximum age limit is 65 years.

The duties to be performed by inspectors of engineering materials and ship construction involve testing and inspecting the type of marine construction, or construction materials; indicated by the optional branches. Inspectors will also read drawings and interpret specifications, as well as make inspection reports and conduct correspondence.

The formal announcements give the complete requirements, including the specific types of substitutions that may be made for the inspectional experience. Persons who are interested are urged to apply immediately for further information and application forms to any first- or second-class post office, or to the Civil Service Commission.

» «

A. M. Byers Company will enter the field of alloy steel manufacture about June 15, when its new electric furnace equipment will be placed in initial operation with capacity of 30,000 to 40,000 tons a year, according to L. F. Rains, president.

Construction of a plant addition and the installation of electric furnace equipment at the Byers Ambridge works have been speeded because of the shortage of alloy steel in the present emergency, Mr. Rains stated, and added that production will begin six weeks ahead of the original schedule.

» «

The unprecedented increase in demand for welding and cutting equipment and supplies again made it necessary for **Victor Equipment Company** to enlarge its San Francisco Welding Division plant. Approximately 11,000 sq. ft. of production and warehouse space was added and the management's foresight in buying numerous new and modern production tools early made it possible to receive delivery of most of these new tools.

The plant now operates on a 24-hour basis and while production still lags considerably behind orders received, the company expects that these new facilities will be more adequate to assure shipment with greater promptness.

The company's Los Angeles plant also will be augmented and certain overflow items will be manufactured at that point.

Personals

The Lincoln Electric Co., Cleveland, Ohio, announces the appointment of **B. J. Brugge** as its Welding Consultant and Engineer at Washington, D. C. He will be engaged in consulting work having to do with the application of arc welding in the National Defense Program and will be available for such work with all governmental departments. He will be associated with **T. A. Canty, Inc.**, Lincoln representatives in Baltimore, Md.

Mr. Brugge is a graduate of Purdue University and began his career in arc welding with 2 years in the Lincoln research laboratory. In 1935 he was granted a leave of absence to assist the application of electric welding in the Near East. Serving in the capacity of welding superintendent for the Anglo-Iranian Oil Co., he spent two years at Iran, Persia, supervising welding operations in construction of refineries and pipe lines and directing the training of many Persians in the art of welding.

Following his work in Persian oil fields, Mr. Brugge spent four months in the British Isles as welding consulting engineer for British and Scottish firms. He has been associated with Lincoln since 1931, formerly in the Los Angeles office and until recently located in Houston, Texas.

Titan Provides the Correct Alloy

FOR EVERY OXY-ACETYLENE BRONZE-WELDING PURPOSE

TITAN Welding Alloys are all scientifically designed, alloyed and fabricated to produce the best possible results for purposes recommended. TITAN Alloys are exceptionally low-melting. Uniformity is assured by rigid laboratory control. *Double deoxidation increases the ductility of the weld, reduces fuming to a minimum and assures a sound, dense deposit.*

TITAN Alloys are furnished in three distinct groups:

- **MUNTZ TYPE: General Purpose Rods, for High-strength Ductile Welds.**
  PENN BRONZE, doubly-deoxidized, low-fuming; flows at 1628°F.
  TITAN BRAZING BRONZE, flows at 1625°F.
- **TIN BRONZES: Hard, Corrosion-resisting; very good on Cast Iron.**
  TITAN BRONZE, doubly-deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL BRONZE, flows at 1615°F.
  TITAN WEARWELL BRONZE, flows at 1593°F. Special purpose rod possessing great hardness; for building up worn surfaces and for bearing service, etc.
- **MANGANESE BRONZES: (General Purpose) Specifically recommended for Cast Iron.**
  TITAN MANGANESE BRONZE, doubly deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL MANGANESE BRONZE, flows at 1620°F.

Only the purest of raw materials are used in manufacture of TITAN Welding Alloys. Electrolytic copper 99.96 plus in purity and electrolytic zinc 99.99 plus are used, in order to assure elimination of elements, which, if introduced into alloy would prove detrimental to quality and uniformity. *TITAN has established new high standards for bronze rod manufacture.*

Ask for descriptive folders. Sample rods sent upon request.

TITAN METAL MANUFACTURING CO., BELLEFONTE, PA.

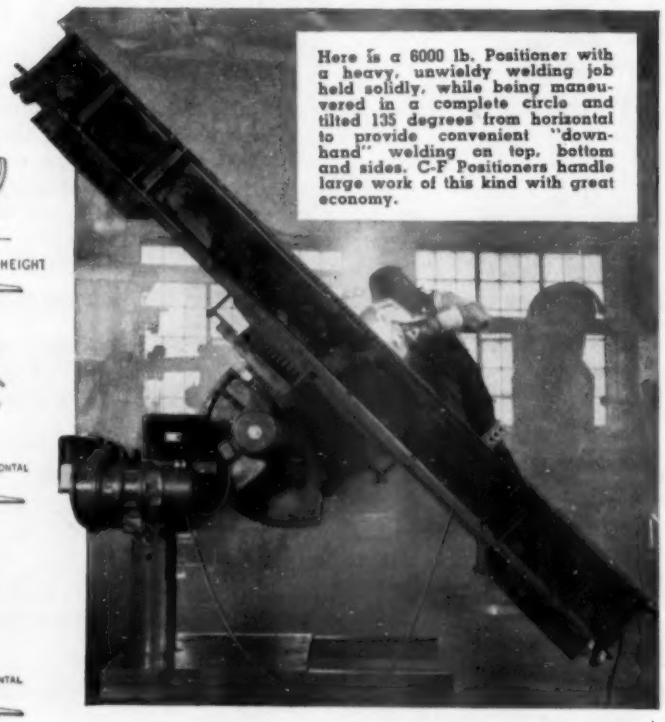
TITAN BRONZE WELDING ALLOYS

Link-Belt Co. announces that **Harry L. Strube** has been appointed chief engineer of the Link-Belt eastern division, with headquarters at the company's Philadelphia plant, to succeed **F. F. (Ferd) Waechter,** who has resigned after rounding out 43 years of service.

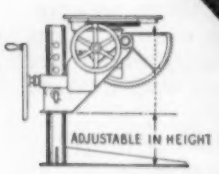
Mr. Strube has been assistant chief engineer at Philadelphia, having begun his Link-Belt service in the engineering department of the company's Pershing Road Chicago plant in 1910. Subsequently he served as sales engineer, first at Chicago and then in Philadelphia. In 1924, he rose to the position of manager of vibrating screen sales, and in 1934, was made assistant chief engineer.

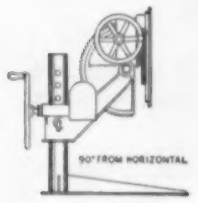
At the organization meeting of the Directors of **Handy & Harman** held April 29th, 1941, the following officers were re-elected: **Cortlandt W. Handy,** Chairman; **G. H. Niemeyer,** President; **R. H. Leach,** Vice-President; **H. W. Boynton,** Treasurer; **H. W. Spaulding,** Secretary. **Judson C. Travis** continues as Assistant to the President; **R. F. Drew,** Manager Providence Plant; **F. L. Spies,** Manager New York Plant. **F. C. Jones,** formerly Assistant to **J. C. Travis,** was appointed Manager of the Bridgeport, Conn. Plant. **J. L. Christie** was appointed Metallurgical Manager. **J. W. Colgan,** Manager of the Toronto, Canada Plant (subsidiary) will become Sales Manager of the parent company.

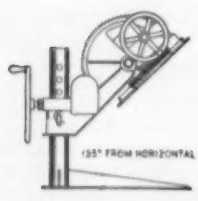
BETTER WELDS
★ LOWER COSTS



Here is a 6000 lb. Positioner with a heavy, unwieldy welding job held solidly, while being maneuvered in a complete circle and tilted 135 degrees from horizontal to provide convenient "down-hand" welding on top, bottom and sides. C-F Positioners handle large work of this kind with great economy.







The diagrams on the left show the triple action of turning, tilting and raising or lowering, common to every C-F Positioner hand — or power driven from 1200 lbs. to 14,000 lbs. capacity. Besides these portable machines, a variety of column-in-floor installations are available so that table may be raised to any desired height. Power operation is also variable. May we send you our Bulletin WP 20 telling the complete story? Production speed is the demand today and here is the equipment for stepping up your production with economy, with additional safety and with a machine that actually improves welding technique.

CULLEN-FRIESTEDT CO.,
1309 S. KILBOURN AVE. CHICAGO, ILLINOIS

At the organization meeting of Handy **& Harman of Canada, Ltd.,** held the same day, the following officers were re-elected: **G. H. Niemeyer,** President; **R. H. Leach,** Vice-President; **H. W. Spaulding,** Secretary-Treasurer. **Thomas H. Gallagher,** formerly in charge of the Chicago Sales Office of the parent company, was appointed Assistant Treasurer of the corporation and Manager of the Toronto, Canada Plant.

» «

Carnegie-Illinois Steel Corp. has appointed **Thomas R. Miller** as Chicago district industrial engineer, succeeding **G. A. Whitehurst,** who recently was transferred to Pittsburgh, where he became assistant to chief engineer of the company.

» «

The Board of Directors of **Crane Co.** at a special meeting on May 5 elected **John H. Collier** as president to fill the vacancy created by the sudden death of Mr. Charles B. Nolte on April 29.

Mr. Collier was born in Chicago in 1884, was educated at Purdue University, and joined Crane Co. on leaving school in 1903. From his original position as core maker's helper 38 years ago he has progressed through a variety of positions giving him a very intimate and thorough grasp of the company's activities. The later and more important positions in this list are: General Manager, Bridgeport, Conn. plant, Crane Co., 1917-1929; President, Cie Crane, Paris, France, and Chairman, Crane Ltd. London, England, 1929-1933; Vice President In Charge of Manufacturing, Crane Co. Chicago, 1933-1941.

» «

Ampco Metal, Inc., Milwaukee, Wis., manufacturers of Ampco Metal and other aluminum bronzes, has shifted the personnel of a number of sales territories.

The Michigan territory is being handled by **J. K. Bybee,** formerly of the Indianapolis office. His headquarters are located at 900 Whitmore Road, Detroit. **E. A. Svoboda** of the Chicago office has been transferred to Indianapolis office and is now located at 3330 N. Meridian Avenue. **W. B. McKenzie,** recently of Buffalo office, has been promoted to the Chicago office, while **A. J. Reynolds,** who previously was an Ampco engineer at Boston, has been transferred also to the Chicago office at 600 S. Michigan Avenue. Boston territory has been taken over by **H. R. Gordon,** 70 Ionia St., Springfield, Mass., who is responsible for Ampco representation throughout the New England states. **Frank P. Gey** has joined the Ampco organization and has been assigned to the Pittsburgh territory, with headquarters at 431 Frick Building.

» «

J. M. Howell, executive assistant to **E. D. Spicer,** manager of the Schenectady Works of the **General Electric Company,** has been named to succeed his chief who has been advanced to the post of assistant to the vice president in charge of manufacturing. Official announcement of the promotions was made by W. R. Burrows, vice president in charge of manufacturing.

The **American Institute of Steel Construction** has appointed **Walter T. Norris** of Oakland, California, as District Engineer for the Pacific Coast, with headquarters at San Francisco. Mr. Norris is a graduate of the University of Detroit. He has been sales and designing engineer for The Moore Dry Dock Company of Oakland, and was engaged in steel construction work in Birmingham, Alabama, before going to the Pacific Coast in 1938.

» «

W. C. Pinkerton, for the past six years Assistant Technical Editor of Chemical Engineering Catalog, has resigned to join the Monel and Rolled Nickel Advertising Department of The International Nickel Company. A specialist in the handling of technical material for the process industries, he will edit house publications devoted to those industries.

» «

Ray J. Thompson, Eastern District Manager of **Ampco Metal, Inc.,** Milwaukee, Wis., has changed his address to 57 White Ave., West Hartford, Conn. Mr. Thompson has supervision over Ampco field offices at Springfield, Mass., New York City, Philadelphia, and Washington, D. C.

» «

Crane Co., Chicago, announces the election of **V. P. Rumely** as Vice President in Charge of Manufacturing to succeed J. H. Collier who was made President earlier this month. Mr. Rumely has been Works Manager of the Crane Chicago plant for the past four years, during which he has been very closely associated with Mr. Collier.

» «

The Lincoln Electric Co., Cleveland, Ohio, announced the election of **M. R. Dill** as a director at its recent annual meeting of shareholders. Mr. Dill was also elected general counsel. He graduated from Lakewood High School in 1925, attended the Wharton School of the University of Pennsylvania for his pre-law education. He graduated from the Law School of Ohio State University in 1930.

Directors and officers who were re-elected include: J. C. Lincoln, Chairman of the Board of directors; J. F. Lincoln, President and General Manager; C. M. Taylor, Vice President; A. F. Davis, Vice President and Secretary; G. G. Landis, Chief Engineer; Harold F. Kneen, Plant Superintendent; J. W. Meriam and W. B. Stewart.

» «

W. K. (Ken) Ebel, chief engineer of The **Glenn L. Martin Co.** and famous as a test pilot, has been named vice-president in charge of engineering and a director of The Glenn L. Martin Company. This announcement was made recently by Glenn L. Martin, president, following an action of the directors.

Hitherto responsible for the engineering, as well as the flight testing, of Martin bombers for Army, Navy and British, Ebel now becomes an officer of the oldest aircraft firm in the country. Under him serve some 1,400 engineers of various classifications.

Current Reviews

Welding and Cutting Equipment

A new 12-page, illustrated booklet, **"What the Purchasing Agent Should Know About Oxy-Acetylene Welding and Cutting Equipment and Processes,"** has just been announced by **The Linde Air Products Co.,** a Unit of Union Carbide and Carbon Corp. The booklet is designed to help the user or prospective user obtain a clear understanding of the oxy-acetylene process and the various construction and operating features of welding and cutting apparatus used in applications of the process. It contains a guide to the selection of the proper type of equipment, with a check list of important points to consider in selecting welding and cutting blowpipes, cutting machines, regulators, and acetylene generators. Also included is a listing of some of the modern applications of the oxy-acetylene flame, suggesting the many uses to which it may be put.

Copies of this booklet, **Form 4694,** can be obtained without cost by writing the nearest office of The Linde Air Products Co. or the General Office, 30 East 42nd St., New York, N. Y.

WHEN the Hebeler Welding Company of Buffalo, New York, were called in on this emergency job, they promptly recommended repair welding with Anaconda 997 Low Fuming Rod.

The job consumed 160 pounds of filler rod and 1,600 feet of both oxygen and acetylene. Chipping, preheating with natural gas and compressed air and other preparation required 35 hours; welding, 11 hours. The result was a strong, sound weld. Next time you're faced with a similar emergency, bear this story in mind. Anaconda Rods are produced in an extensive line of alloys for all kinds of welding. Get them from your jobber. AIM

ANACONDA *Anaconda Welding Rods*

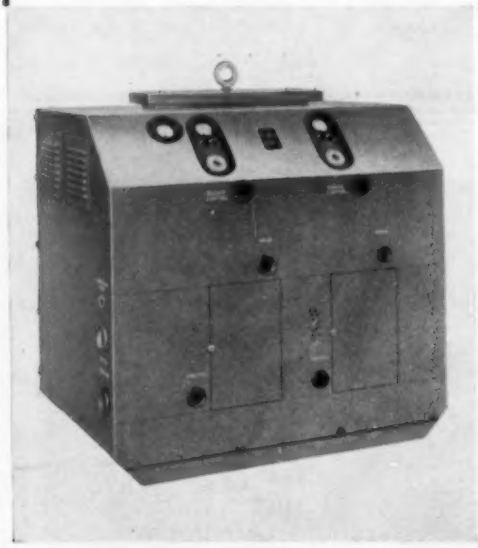
THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company — In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

CRAMPED FOR FLOOR SPACE?

. . . WALL-MOUNTED G-R WELDERS WITH REMOTE CONTROL WILL SOLVE YOUR PROBLEM – NOW!

G-R's reliable remote control system gives you perfect current regulation from pushbutton stations installed anywhere in the welding area—or mounted right on the tongs. You can mount the G-R welder up out of the way—and save ALL your floor space for WORK!



At left is the new G-R Model 65, 100-1250 amp. unit for manual and automatic, single or multi-circuit operation. Available with Remote Control and Power Factor Correction. Write for complete information on this and other G-R welders (from 125 to 2,000 amp. capacity).

GLENN-ROBERTS COMPANY

1009 Fruitvale Avenue, Oakland, California

Branch: 5651 West Ohio Street, Chicago, Illinois

Oil Circuit Breakers Leaflet

Oil circuit breakers for starting motors are described in a new 6-page leaflet announced by **Westinghouse Electric and Mfg. Co.** The general types of control are listed in the order of their severity on the breaker contacts. Wiring diagrams show common types of control schemes.

Distinctive features, construction, and operation of the breakers are described. Overload and undervoltage protection are discussed. Blackline drawings show position of parts and give physical dimensions. Maximum current and voltage ratings for the various styles are listed with complete instructions for ordering. A copy of Descriptive **Data 33-220** may be secured from department 7-N-20, Westinghouse Electric and Manufacturing Co., East Pittsburgh.

» «

Information Please

The Welding Engineer is endeavoring to locate the manufacturer of "The New-Way Round File Gas Lighter". It will be appreciated if anyone knowing the manufacturer's name and address or the manufacturer will communicate with The Welding Engineer.

» «

New Price Lists Issued by Chicago Hardware Foundry

The Chicago Hardware Foundry Co., North Chicago, Ill., has issued Price List No. 22 covering its entire line of fluxes. A new Price List, No. 23, including cast iron rods and electrodes and aluminum rods has also been prepared for distribution.

» «

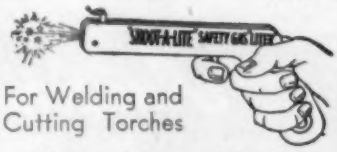
New Booklet on Welded Steel Base Plates

A new 8-page Booklet No. 1882, covering a line of welded steel base plates for adjusting pillow blocks and common flat boxes for shaft alignment, is announced by Link-Belt Co., 2410 West 18th St., Chicago.

Type "A" Base Plates, for horizontal adjustment only, consist of a welded steel frame fitted with either one or two adjusting screws. Type "B" Base Plates, for both horizontal and vertical adjustment, consist of a welded steel frame, two cast iron wedges, and two sets of adjusting screws.

The Practical Lighter

SAFE! SURE! STRONG!



For Welding and Cutting Torches

Ask Your Jobber or Write Us

SHOOT-A-LITE CORP.

118 East 28th St. New York, N. Y.

America's Factories

A favorable picture of the possibilities for expanding America's manufacturing industries for defense is given in a survey of factory growth during the last four decades, published by the **Public Affairs Committee,** 30 Rockefeller Plaza, New York City. The survey, entitled **America's Factories,** was summarized by Maxwell S. Stewart from a long-range study of American manufacturing industries made by the National Bureau of Economic Research under a grant from the Maurice and Laura Falk Foundation.

It shows that the output of the manufacturing industries of the United States increased by 276 per cent from 1899 to 1937. This is an average increase, covering good years and bad, of 3½ per cent, or more than twice the growth in population during the period. The increase is considerably larger than had been supposed on the basis of earlier and less complete studies.

America's Factories is the fifty-fifth of a series of factual, 10-cent pamphlets published by the Public Affairs Committee. Another pamphlet in the industrial field is **Industrial Price Policies,** also by Maxwell S. Stewart, editor of the Public Affairs Pahphlet series.

» «

Engineering Terminology

The **American Standards Association** reports completion of the revision of American Standard Abbreviations for Scientific and Engineering Terms. This standard, providing as it does the short-

Prevent Bonding of Welding Spatter and Flash

Reduce Labor Costs & Increase Production with

SPATTER-EX · FLASH-EX

SPATTER-EX

Spatter-Ex is a thin, transparent, jelly-like compound—harmless and non-inflammable—and an effective spatter preventative in either arc, flash or butt welding. Applied by brushing, swabbing or spraying before welding, Spatter-Ex eliminates subsequent chipping, grinding, steel brushing or other cleaning operations.

FLASH-EX

Flash-Ex compound—white and pigmented—is used extensively in resistance welding to prevent dies and holder jaws from becoming jammed with spatter. Also effective on multi-pass welds with non-ferrous metals having greater heat conductivity than steel.

Both of these water soluble compounds have been thoroughly tested in production use and are now being used regularly in many of the country's major industrial plants.

Put up in 1-5-10 gallon pails and 55 gallon drums.

OTHER WAYNE PRODUCTS

Meltomatic Paste Solder
Protex Non-Rust Oils
Aqua Sol Grinding Compounds

Write for Samples and Folders

WAYNE CHEMICAL PRODUCTS CO.

9800 Copeland Ave. Detroit, Mich.

hand of engineering and scientific language, has a very wide application. It includes such common terms as pounds per square inch (psi), dollar ($), and dozen (doz), as well as kilograms per second (kgps), reactive volt-ampere (var), and British thermal unit (Btu).

The standard has been developed by a group of engineers, editors, and scientists representing many national organizations. Leadership for the work has been taken by the American Association for the Advancement of Science, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education.

This standard—**Abbreviations for Scientific and Engineering Terms (Z10.1-1941)** is now available in pamphlet form and may be obtained by sending 35 cents to the American Standards Association at 29 West 39th Street, New York City.

» «

Booklet on Machine Cutting

A revision of the booklet, **"Opportunities for Profits with Portable Machine Cutting,"** has just been announced by **The Linde Air Products Co.**, a Unit of Union Carbide and Carbon Corp. This booklet describes the many advantages of oxy-acetylene cutting with portable machines, the diversity of operations which can be performed, and a variety of applications. Several new profitable "hints and kinks" on the use of these machines have been added.

The general operations possible — straight-line cutting, bevel-cutting, shape cutting, circle-cutting, and heavy cutting — are illustrated in this booklet, and a number of views of cut edges are given to illustrate the results of correct and incorrect cutting techniques. In addition, some typical applications in the aircraft and automotive industries, iron and locomotive works, machine shops, job welding shops, shipyards, and steel mills are listed. The section on suggestions for extending the usefulness of portable machine-cutting has been enlarged; and a new page describing a special setup for templet-tracing has been included.

Copies of this 20-page booklet, **Form 4062B**, can be obtained without cost by writing the nearest office of The Linde Air Products Company or the General Office, 30 East 42nd Street, New York, N. Y.

» «

Welding Safety

The International Acetylene Association is making available to all those engaged in welding and cutting work copies of its booklet **"Preventing Welding and Cutting Fires."** In this booklet it is pointed out that the oxy-acetylene industry has long stressed the need for safety and fire prevention, and that the splendid safety record which has been established down through the years is a tribute to all those who have had occasion to do welding or cutting work. It was urged that all welding operators, however, exercise special vigilance during the present national emergency.

Copies of the 16-page booklet, "Preventing Welding and Cutting Fires," can be obtained by writing to The Secretary, **International Acetylene Association**, 30 E. 42nd St., New York, N. Y.

» «

Seam and Spot Welding Technique Discussed in New Leaflet

Useful information on the technique of seam and spot welding is given in a new 4-page leaflet announced by **Westinghouse Electric and Manufacturing Company.**

Factors affecting pressure, current, and timing are discussed with special emphasis on time of current flow. Synchronous and non-synchronous control applications are treated with recommendations for the proper use of each system.

Specifications for aluminum and brass welding are given. Tables list data on seam welding of mild pickled and oiled steel, spot and projection welding.

A copy of descriptive data 18-333 may be secured from department 7-N-20, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

The Improved "Round File" Gas Lighter

Most Economical

Unrivalled economy is provided by the many superior, exclusive design and construction features of the Improved "Round File" lighter.

A large file area is provided —approximately one square inch. **The file is of superior quality, hardened in our own factory. The spark metal is of large diameter and the patented cartridge holding the metal locks exactly into position,** permitting instant replacement. **The lighters are cadmium plated, rustproof. Every part thoroughly tested.**

Circular and prices on request.

SAFETY GAS LIGHTER CO. (Est. 1901) **LYNN, MASS.**

Are Your Electrodes Thoroughly Dried?

Proper Drying is one of the most important factors in making good electrodes. That is why large producers* of coated welding rods have installed STEINER ELECTRODE DRYING OVENS.

*Names on request.

STEINER OVEN STEINER OVENS FOR BEST RESULTS **DIVISION**

STEINER-IVES COMPANY, 16 Avenue L, NEWARK, N. J.

Recent Patents

Welding Rod

2,239,465. **Agostino Nepoti, Sesto Calende,** Varese, Italy. Filed Dec. 13, 1938. Issued Apr. 22, 1941. An electrode is described which consists of special materials having high resistance, high coefficient of percentage lengthening and high resilience. The rod consists of 0.08 to 0.11% carbon, 1.2 to 1.4% manganese, 0.55 to 0.75% chromium, 0.25 to 0.35% molybdenum and the remainder iron. The reduction in the percentage of carbon serves to prevent structural variations of hardening due to a high velocity of cooling especially in the first layer of the deposited material. Such reduction, however, would tend to simultaneously diminish the resistance of the added material and to lower its elastic limit. The presence of a greater percentage of manganese which, however, must not be too high, partially prevents the reduction of the resistance. Too high a percentage of manganese affects the structural condition of the weld. The chromium and the molybdenum are improving agents. Nickel may also be added as a stabilizing agent.

» «

Current Termination

2,239,577. **Robert O. Serckx,** Brussels, Belgium, assigned to **La Soudre Electrique Autogene,** Brussels, Belgium. Filed Aug. 24, 1937. Issued Apr. 22, 1941. The object of this invention is the avoidance of the formation of the crater which is produced at the end of a welding fillet when the welding arc is broken by its abrupt elongation. The crater can be avoided by reducing the welding current at the end of the welding operation for several seconds. An automatic relay reduces the welding current by 30 to 35% for a time of 4 to 5 seconds. The heat evolved by the reduced current allows deposited metal to flow into the crater and to fill it. The reduction of current is carried out while the end of the electrode is maintained in its normal welding position.

» «

Torch

2,239,885. **Sanford J. Errett,** Portland, Oreg. Filed Aug. 22, 1938. Issued Apr. 29, 1941. Prevention of the formation of explosive mixtures in cutting and welding torches is an object of this patent. To prevent the leakage of high pressure oxygen due to expansion and contraction of the torch, a brazed joint is used between the tip and the torch head. Other safety measures include large chambers in the low pressure gas lines for cushioning minor explosions in the tip.

» «

Bronze Welding Electrode

2,238,392. **Milan A. Matush,** Milwaukee, Wis., assigned to **Ampco Metal, Inc.,** Milwaukee, Wis. Filed Dec. 4, 1939. Issued April 15, 1941. A bronze welding rod is described which comprises a bronze rod and a covering containing a fluoride and a metal of the group of aluminum nickel, chromium and manganese, or an alloy thereof. A suitable binder is employed in the covering.

» «

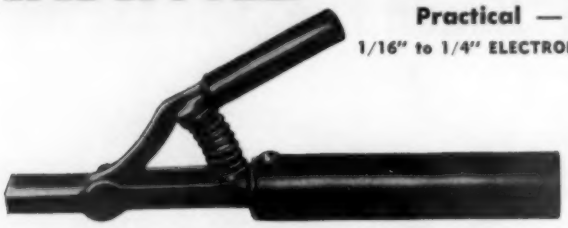
Spot Welding

2,238,419. **Walter Haas,** Berlin, Germany, assigned to **Bernhard Berghaus,** Berlin, Germany. Filed Sept. 28, 1938. Issued April 15, 1941. This patent discloses a spot welder which includes four electrodes. A first electrode and a second electrode spaced from the first engage one face of the material to be welded; a third electrode and a fourth electrode spaced from the third both engage the opposite of the material in an opposing relation to the first and second electrodes. A voltage is impressed from an electrical source across the first and fourth electrodes and across the second and the third electrodes. Welding currents are thereby caused to flow in succession of one another periodically through the same spot of the material being welded through two paths crossing one another at said spot.

IMPROVED **SIMPLEX ELECTRODE HOLDERS**

Practical — Economical — Light

1/16" to 1/4" ELECTRODES **WEIGHT 15 OZ. EACH**



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JUST OFF THE PRESS

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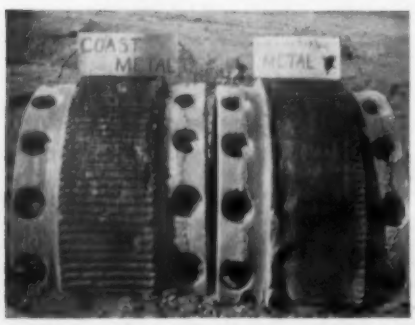
THE FIBRE-METAL PRODUCTS CO. CHESTER, PENNA.

COATING WITH COAST ...Hot Clinker Rolls *in the* Cement Mill



Hard facings have been developed for industries where abrasion, impact and high temperature reduce service life of wearing parts, but with Coast Metals you get even greater service life as is evidenced by the two hot clinker rolls illustrated. Investigate Coast Metals today for your hard facing jobs.

There are 11 types of Coast Metals, all easily applied to any ferrous metal, alloy steel, manganese steel, cast or chilled irons by the oxy-acetylene torch or electric arc.

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R.W.M.A. RECOMMENDED ELECTRODE MATERIALS FOR SPOT WELDING SIMILAR AND DISSIMILAR METALS USING CONVENTIONAL SPOT WELDING METHODS ~ ~

TO WELD SIMILAR METALS

FERROUS

TO WELD SIMILAR METALS READ BLOCK UNDER METAL TO BE WELDED	TIN PLATE STEEL		TERNE PLATE STEEL		GALVANIZED IRON ZINC PLATE		CADMIUM PLATE STEEL		CHROME PLATE STEEL		STAINLESS STEEL 18-8 TYPE		SCALY H.R STEEL		C.R. STEEL H.R. STEEL CLEAN	
	B	I	A	I	A	I①	B	I	A	II	A	III⑤	B	I⑤	A	II
	I	3	I	3	I①	3	I	3	II	3	III①		I⑤	2	II	

NON - FERROUS

ALUMINUM		ALUMINUM ALLOYS DURALUMINUM		CUPRO NICKEL		NICKEL SILVER		NICKEL		NICKEL ALLOYS MONEL NICHOME (HIGH RES)		BRASS YELLOW 25%-40% ZINC		PHOSPHOR BRONZE GRADE A, C & D		SILICON BRONZE EVERDUR OLYMPIC DURONZE HERCULOY	
B	I①	B	I①	A	II	B	II	A	II	A	II	B	II	A	II	A	II
I⑤	2	I①	2	II		II		II		II		II		II		II	

TO WELD DISSIMILAR METALS

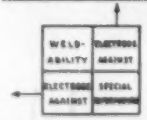
FERROUS ALLOYS	STAINLESS STEEL 18-8 TYPE		CHROME PLATE STEEL		CADMIUM PLATE STEEL		GALVANIZED IRON		TERNE PLATE STEEL		TIN PLATE STEEL	
COLD ROLLED STEEL HOT ROLLED STEEL, CLEAN	A	II①	A	II	B	II	B	I	A	I①	B	I
	II		II	3	II	3	II	3	II	3	II	3
TIN PLATE STEEL			B	II	B	I⑤	B	I	B	I⑤		
			I	3	I	3	I	3	I	3		
TERNE PLATE STEEL	B	II	B	II	B	I⑤	B	I				
	I	3	I	3	I	3	I	3				
GALVANIZED IRON ZINC PLATE	B	II	B	II	B	I						
	I	3	I	3	I	3						
CADMIUM PLATE STEEL	B	II	B	II								
	I	3	I	3								
CHROME PLATE STEEL	A	III⑤										
	II	3										

NON-FERROUS ALLOYS	NICKEL ALLOYS		NICKEL		PHOSPHOR BRONZE		SILICON BRONZE		YELLOW BRASS		NICKEL SILVER	
CUPRO NICKEL	B	II			B	II	B	II			B	II
	II				II		II				II	
SILICON BRONZE EVERDUR-OLYMPIC DURONZE-HERCULOY					B	II	A	II	B	II		
					II		II		II			
NICKEL SILVER	B	II			B	II	B	II				
	II	I			II	I	II					
NICKEL ALLOYS	A	II	A	II								
	II		II									
STAINLESS STEEL 18-8 - TYPE	B	II	B	II								
	III①	I	I⑤									

ALUMINUM ALLOYS DURALUMINUM	ALUMINUM	
	B	I①
	I①	2

LEGEND

BLOCK INTERPRETATION



WELDABILITY

A - EXCELLENT
B - GOOD

ELECTRODES

R.W.M.A. SPECIFICATIONS

I - GROUP A CLASS 1
II - GROUP A CLASS 2
III - GROUP A CLASS 3

NOTE: ELECTRODE MATERIALS IN CIRCLES ARE SECOND CHOICE - EXAMPLE ②

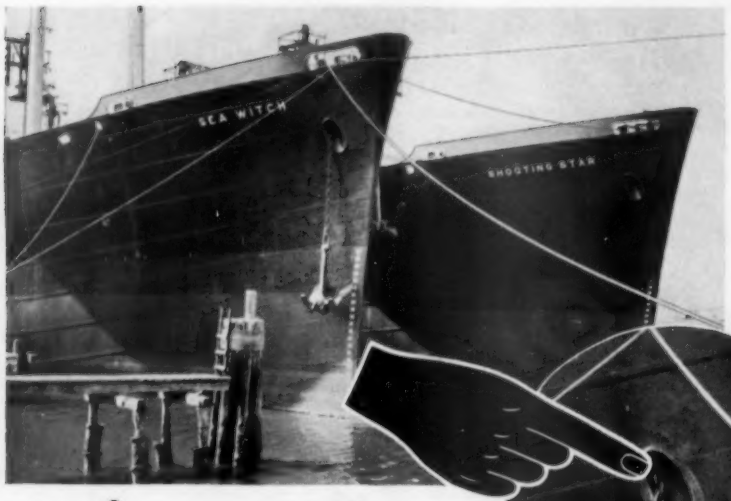
SPECIAL INFORMATION

1 - SPECIAL CONDITIONS REQUIRED
2 - GOOD PRACTICE RECOMMENDS CLEANING BEFORE WELDING
3 - IF PLATING IS HEAVY, WELD STRENGTH IS QUESTIONABLE

RESISTANCE WELDER MANUFACTURERS ASSOCIATION · R.W.M.A. · ALLOY GROUP

This chart adopted by the Resistance Welder Manufacturers Association embodies the best general recommendations that can be made for the selection of the proper electrode materials for spot welding similar and dissimilar metals. ~ ~

These recommendations for electrodes can be effective only when the other essential factors of the correct time, current and pressure are properly controlled. ~ ~



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MEANS ANOTHER JOB FOR

HARCOTE!

Here's a typical use for this hard surfacing electrode—designed for "overlaying" parts subjected to severe wear and abrasion.

Its weld metal is semi-austinitic with a hardness of approximately 50, Rockwell C, in its as-welded state. Under cold working it builds up great resistance to abrasion. May be applied on carbon steel, low alloy, and high manganese surfaces.

Use HARCOTE for These Surfaces

HARCOTE is also recommended for the hard surfacing of many products such as shovel teeth, scraper blades, farm implements, lips and bottoms of shovel buckets, sand and rock handling equipment, etc. It's an all-position electrode. Procedures are simple. Write for full information.

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Rod Coating

2,240,033. **Arthur T. Cape** and **Charles V. Foerster, Jr.**, Santa Cruz, Calif. Filed Feb. 20, 1939. Issued Apr. 29, 1941. Various coatings are shown for securing various degrees of hardness in welded deposits. The coatings are used on chromium-nickel ferrous welding rods. For soft weld deposits, the coating includes 15 parts of plumbago and 13 parts of sodium silicate. For hard weld deposits, 5 parts of graphite are used to 3 parts of sodium silicate. A mixture of Bentonite and water serves as a binder. The coating can be used with various ferrous alloy welding rods as well as with plain carbon steel.

» «

Blowpipe

2,238,470. **Wilgot J. Jacobsson**, Scotch Plains, and **Samuel R. Oldham**, Elizabeth, N. J., assigned to **Oxweld Acetylene Co.**, of West Virginia. Filed Oct. 20, 1937. Issued April 15, 1941. This invention relates to a blowpipe attachment which is adapted to use either low or medium fuel gas. Fuel gas, such as acetylene, may be available at different times as low pressure gas or as medium pressure gas. The pressure may vary from 1 to 15 pounds per square inch. The blowpipe of this patent may be used efficiently with fuel gas at different pressures. Such use is possible without the employment of special mixers. The blowpipe is also suitable for cutting purposes. The blowpipe is able to resist flashback, such resistance being increased by the use of a fuel gas passage having a portion containing a large volume of fuel gas to receive and extinguish backfires from the mixing nozzle.

» «

Portable Spot Welder

2,238,679. **Edward F. Cooper**, Auckland, New Zealand. Filed Aug. 15, 1939. Issued Apr. 15, 1941. Increased accessibility to parts to be united by welding, as in the manufacture and repair of automobile bodies and parts, is claimed by the inventor of the welder of this patent. The apparatus comprises a U-shaped frame at whose ends the two electrodes are held. By means of a lever mounted on the frame, several sequential operations are made to occur. Initial downward movement of the lever causes electrode contact with the work. Welding current is also initiated by the movement. The lever is held in place sufficiently long to allow the parts to be welded to be heated to welding temperature. Further downward movement of the lever then causes welding to take place under pressure. The welding bits are made of copper and are cooled by means of a compressed air jet.

» «

Welding Flux

2,239,018. **William M. Rogerson**, New Kensington, Pa., assigned to **Aluminum Co. of America**, Pittsburgh, Pa. Filed May 14, 1937. Issued Apr. 22, 1941. For producing a welded joint between alumi-

num and copper, a fusion, weld is made in the presence of an alkali metal halide flux and metallic cadmium. The weld is characterized by high tensile strength, high electrical conductivity and an improved resistance to corrosion as compared to a soldered joint between the same two metals.

» «

Control System

2,239,053. **Frank H. Roby,** assigned to **Square D Co.,** Detroit, Mich. Filed Sept. 28, 1939. Issued Apr. 22, 1941. It has been found that in starting up a pneumatic spot welding tool form, a long period is required to establish proper electrode pressure due to the necessity of working against a static oil film and other factors which tend to slow up the first welding operation. Therefore, in the case of single welds and also in the case of the first weld in a series of welds, a greater delay between the initiation of electrode pressure and the energizing of the electrode is required than is necessary for the succeeding welds in a series. This invention provides a system in which a time delay occurs during the first weld in a series, or during a single weld. This delay permits a longer flow of welding current than is employed during succeeding welds.

» «

Electrode Bracket

2,239,418. **Joseph A. Fotie,** Kansas City, Mo. Filed July 1, 1940. Issued Apr. 22, 1941. This patent relates to an adjustable bracket which includes a sliding electrode arm fastened at one end to a movable bearing. The bearing can be secured in a predetermined position to a fixed base which has a groove in which the bearing moves. A current conductor is secured to another side of the base, the conductor having a number of elements extending outwardly from a point to cover a major portion of the area of the side of the base opposite to the bearing side. By means of this structure, the movable part of the bracket can be adjusted to any desired position without any change in the intensity of current supplied to the electrode. The conductor is composed of a series of superimposed strips of copper to distribute the current evenly over the face of the base.

REGISTERED U. S. PATENT OFFICE

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11 to 13½% Manganese Nickel Steel
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SAVE STEEL BY WELDING"

Illustration shows Applicator Bars on Crusher Plate.

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Resistance Welding

2,240,170. **John B. Borgadt,** East Cleveland, Ohio. Filed Sept. 2, 1939. Issued Apr. 29, 1941. To prepare material for welding a grinding or machining operation is employed prior to the welding operation to provide a clean surface. The material to be welded originally has sufficient thickness to permit loss by the mechanical cleaning operation. The process is described with particular application to welded tubes.

» «

Electrode Adjustment

2,240,627. **Ernest Riemenschneider,** Lakewood, Ohio, assigned to **The Midland Steel Products Co.,** Cleveland, Ohio. Filed Nov. 26, 1938. Issued May 6, 1941. In combination with an electric welding apparatus comprising a welding head, an electrode adjustably associated with the head, an insulated electrode holder movably mounted with respect to the head, and a conductor secured directly to the electrode to move therewith, and a conductor cable secured to the conductor in parallel relation to the electrode. The conductor cable is movable in such a way as to prevent flexing at the point where it is connected with the conductor.

» «

Weld Rod

2,240,672. **Robert Scherer, Gerhard Riedrick,** and **Hans Hougardy,** Krefeld, Germany, assigned to Deutsche Edelstahlwerke, Krefeld, Germany. Filed Aug. 9, 1939. Issued May 6, 1941. This invention takes cognizance of the fact that the known high-quality welding steels of chrome austenitic character may show a deteriorating tendency. Deterioration of welds produced by thermal fusion of chrome steels is prevented if the steel, besides being austenitic, contains a substantial amount of ferrite. The range of ferrite is from 5 to 35%, leaving 95 to 65% austenite. A suitable welding rod is disclosed as consisting of an austenitic-ferritic alloy steel containing about 22% chromium, about 10% nickel, about 0.1% carbon, the remainder substantially all iron with small amounts of auxiliaries and impurities.

» «

Metal Confinement

2,241,216. **George H. Phelps,** Floral Park, N. Y., assigned to **Metropolitan Engineering Co.,** Brooklyn, N. Y. Filed Aug. 17, 1939. Issued May 6, 1941. By the method of this invention a butt weld is effected between two pieces of metal and the metal extruded at the joint is confined within a limited, permanently closed space by means of a shield which overlaps the joint.

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WELDING ELECTRODES
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MACHINEABLE —
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GAS TIGHT —
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MILBURN CUTTING AND WELDING TORCHES—Sturdily constructed to highest government standards. Illustrated is the Type HMS—a modern development in the welding art. With attachments it can be used for welding, brazing, soldering and cutting.

TYPE OM SPRAY GUN—Light in weight, compact. Operates as production unit for continuous service or for touch-up work. Features "Hollow Air" atomizing principle. Top efficiency with all types of spray material.

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Write for complete catalog of paint spray equipment, welding and cutting apparatus and regulators.

The ALEXANDER MILBURN Company

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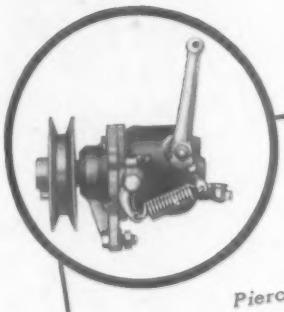
A Pierce Flyball Governor is the sensitive "heart" of this G. E. 200-ampere Portable Welder with 1750 R.P.M. Ford V-8 60 H.P. Engine, doing general job work. Owned by Sutton-Garten Company, Indianapolis. Pierce Belt-Driven Flyball Governors are readily installed on any engine.



Pierce Governors are also standard equipment on — Electric Arc, General Power, Harnischfeger, Hobart, Lincoln, Wilson, and other engine-driven welders.

● "We credit the Pierce Flyball Governor for much of the splendid performance of our 200-ampere G. E. Welding equipment," writes W. F. Garten of Sutton-Garten Company, Indianapolis. "The Pierce Governor is instantaneous —the current recovers its characteristics completely within 3/10th of a second after striking arc. That's pretty difficult service and the governor has to be good to bring the unit back to speed so fast. Our Pierce Governor is giving split-second sensitivity with unfailing dependability."

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Pierce Governors

STANDARD SINCE 1913

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At the end of twenty-five years it seems fitting to stop for a bit and look back on the accomplishments of Alternating Current Transformer Welding.

Twenty-five years ago the Steinbock Electric Company of Peekskill, N. Y., predecessor of Electric Arc, Inc., was organized by C. J. Holslag, to sell one of the first transformer welders, known then, facetiously, as the "jazz-box". Through the years recognition has grown to wide acceptance among industrial fabricators.

Now the lowly "jazz-box" has grown to be a synchronous symphony orchestra giving its bit to the harmony of industrial fabrication.

It preheats, welds, normalizes, works on automatics, or on hand work — faster, cheaper, better.

Truly A.C. welding has progressed at its Twenty-fifth Anniversary.

If you had twenty air guns, would you buy twenty air compressors?
It is just as silly to buy twenty single arc welders.

ELECTRIC ARC, INC.

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